An Evaluation of Compensatory Mitigation Projects Permitted Under Clean Water Act Section 401 by the Los Angeles Regional Quality Control Board, 1991-2002.

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Executive Summary

In 2002, the Los Angeles Regional Water Quality Control Board (LARWQCB) obtained a grant from the Environmental Protection Agency (with matching state funds) to evaluate the success of compensatory mitigation projects associated with water quality certifications issued under Clean Water Act Section 401. The LARWQCB's objective was to assess how well the goal of "no net loss" of wetlands was being met in the Los Angeles region. Due to staffing limitations, the LARWQCB could not carry out this project internally, so they contracted with UCLA to perform the study. This report summarizes the results of the evaluation of Section 401 permits.

This project evaluated permit compliance and wetland functions in wetland compensatory mitigation projects in Ventura and Los Angeles Counties. All of the projects studied were granted permits requiring mitigation from the Los Angeles Regional Water Quality Control Board under Section 401 of the Clean Water Act. The assessment of mitigation projects included an extensive review of permit files followed by field monitoring to assess the condition of the habitat and map the area of the mitigation sites. This project was undertaken to help the Regional Board determine when and where mitigation wetland sites are likely to fail. By providing information about successful and failed mitigation sites, it will help the Regional Board determine an appropriate prioritization for proposed mitigation techniques.

Methods

The initial plans for this project called for a two-phase evaluation effort. Phase I was to involve an initial site reconnaissance visit for each of 50 permit files, including a permit compliance evaluation and a GPS (Global Positioning Satellite)-based survey of the site to determine mitigation project acreages. For a subset of 25 files, sites were to be visited a second time to perform a functional evaluation (Phase II), which would be more time consuming than the reconnaissance visit. After a series of early site visits, we determined that a substantial amount of time was required simply to understand the nature of the impact and mitigation projects and to determine the precise location and boundaries of the mitigation site(s). This, and the fact that individual permit files commonly involved several independent and distinct mitigation projects, meant that it was not feasible to perform a quick reconnaissance of several nearby projects on the same field day. In addition, during those early site visits, when we tested the use of our functional assessment evaluations, we determined that it would be feasible to perform the functional assessment for all 50 files, doubling the number of sites included in "Phase II." We decided, therefore, that it was much more efficient to perform both the initial compliance assessment and the functional evaluation on the same day, rendering a second visit unnecessary. Therefore, we combined the Phase I and Phase II assessments into a single site visit.

The central goal of this project was to assess compliance and function of a set of mitigation projects required by the Los Angeles Regional Water Quality Control Board (LARWQCB) under Section 401 of the Clean Water Act. We selected permits for assessment based on a physical review of permit files archived at the LARWQCB office. To ensure a broad representation of mitigation project ages, we sought to complete a permit review with files stratified by year, with at least 20 permit files requiring compensatory mitigation per year from 1990 to 2003. Since key documents were frequently absent from the LARWQCB files, we supplemented our file survey by reviewing the file archives at the United States Army Corps of Engineers office in Ventura. As we went through each storage box in the search for files, the basic information from nearly 900 permit files was recorded. For 250 of the 319 files that contained mitigation requirements, photocopies of all pertinent information were made to facilitate our office and field assessments. A new Microsoft Access database was designed specifically for use on this project. Information from all 250 photocopied files was entered into this database, including basic project data, permittee, agent, location, impacts and mitigation, and permit conditions. All data collected through our office and field assessment of compliance, as well as all primary and supplemental data collected through the functional evaluations, were entered into this Access database. The GPS data were managed separately.

Fifty permit files to be included in our compliance and functional evaluations were selected randomly from the total population of 250 files with mitigation requirements. We conducted site visits at all mitigation sites associated with these 50 permits. At many sites, the site visit uncovered information indicating that the site was not suitable for assessment (e.g., the mitigation construction was still in progress); in all of these cases the file was removed from our list of 50 assessed files and replaced by an additional randomly chosen permit. In addition to these excluded permit files, there were five files for which compliance evaluations could be made, but where functional evaluations were not possible because of ambiguities in their in-lieu fee programs. Because we wanted a set of 50 fully assessed (Phase I and Phase II) files, an additional five files were added, resulting in a total of 55 files evaluated for compliance.

We determined the acreage of mitigation sites using a survey-grade GPS. To fulfill the acreage requirements mandated by the regulatory agencies, and given the resource limitations of the typical permittee, an individual permit file may have from one to four discrete mitigation project sites that may blend together several different habitat types (e.g., wetlands, alluvial scrub, riparian areas, etc.), and multiple mitigation actions (e.g., restoration, enhancement, preservation). Where possible, we distinguished between discrete mitigation sites, and these were surveyed and evaluated separately. Of the fifty permit files we assessed, 20 files had multiple discrete mitigation project types that yielded 79 individual mitigation site evaluations. Frequently, we were unable to determine the boundaries of a mitigation site although we could determine the general area; in these cases, we recorded a single GPS reading at the approximate location of the mitigation site.

Each permit file has a series of standard and special conditions associated with it specifying management actions or performance standards that must be accomplished in order to meet the compliance requirements of the permit. We define compliance as the percent of conditions met, as determined through our field and/or office assessment. We assessed three different types of compliance: (1) compliance with the actual permit conditions; (2) compliance with "modern" permit conditions, the more inclusive and specific conditions that would have been imposed on older permits had they been processed recently; and (3) compliance with the mitigation plan, which is designed to accommodate the requirements of all agencies (e.g., U.S. Army Corps of Engineers and California Dept. of Fish and Game). For files with multiple mitigation sites, we evaluated compliance at each mitigation site separately, resulting in 79 field compliance evaluations. These were combined with the five permit files containing in-lieu fee payments for a total of 84 individual compliance evaluations. A subset of permit conditions often could not be assessed because of the age of the site or the nature of the condition; for example, it is not possible to determine if a site was mulched ten years ago.

The functional evaluations of the mitigation sites were conducted using the California Rapid Assessment Method (CRAM), modified specifically for this project (called UCLA-CRAM), along with supplemental information collected at each site. Supplemental assessments evaluated the success and appropriateness of the mitigation work, plant/habitat community characteristics, wetland conditions and jurisdictional habitat, and beneficial wetland/riparian services gained compared to what was likely lost at the impact site. Full functional assessments including CRAM, UCLA-CRAM and all other supplemental evaluations were performed for all 79 discrete mitigation projects. Analyses were performed either by mitigation site (all 79 sites) or by permit file (data from multiple sites combined for each of the 50 permit files) as appropriate. Digital photographs were also taken at each mitigation site.

Results

Ninety of the >200 LARWQCB storage boxes were inventoried. Within these 90 boxes, 887 permit applications were found from 1991 to the present, for which 601 permit certifications were issued, with 319 requiring some form of mitigation. Residential/urban development projects were the dominant project type permitted (35%), followed by flood control, bridge crossing, and bank/channel work projects (18%, 16%, and 16%, respectively). Pipeline/utility projects were about half again as common (7%), and the remainder of the project types were represented by just a few files each. Permanent impacts were twice as common as temporary impacts (66% compared to 33%). Restoration projects were the most common (46%) type of mitigation project, followed by creation (27%), enhancement (20%), and preservation (8%).

Sixty-nine percent of the sites (48 of 79 sites) complied with 100% of the (assessable) conditions; 31% did not comply with all of the permit requirements (Figure ES1). Only one site did not comply with any of the requirements. A much lower percentage of sites achieved 100% compliance with the modern conditions compared to the stated 401 permit conditions. This is to be expected since the permittee of a past project was not required to comply with the conditions typically included in more recently issued permits. However, 70% of the sites had compliance of 70% or higher, which is similar to the results for the stated permit conditions. Thus the majority of mitigation projects would have been in or near compliance with the set of modern permit conditions, had they been required. Compliance with the mitigation plan was similar to compliance with the stated permit conditions: 67% of the sites achieved 100% compliance.

A summary of the compliance for individual conditions that were commonly specified in 401 permits is presented in Table ES1. The surveyed mitigation projects generally did well on revegetation conditions, with 100% of mitigation sites meeting the "presence of species specified for revegetation" condition and 94% meeting the "native vegetation present?" condition. These high rates of success can be attributed in part to the simple yes versus no (presence/absence) nature of the compliance evaluation for these conditions. Only two conditions were never found to be out of compliance: grading to pre-project contours, and the presence of specified plant species. Both of these conditions relate to the initial establishment of the mitigation sites, suggesting that the contractors constructing the mitigation are reasonably diligent. However, conditions relating to longer term maintenance and performance of the mitigation sites, such as maintenance in perpetuity and lack of exotic species, had much lower rates of compliance.

The total area lost permitted through these 50 permits was about 170 acres. This represents the acreage of "waters of the United States," including wetlands and non-wetland waters that were within the limits of federal jurisdiction as identified in Section 404 and Section 401 permits. The total acreage required to offset these losses was 233 acres, which would have represented a net gain of about 63 acres of wetland and other waters habitat (a gain/loss mitigation ratio of 1.38:1). The total area "gained" that we measured through our GPS survey was approximately 226 acres, assuming that 15 mitigation sites with undeterminable boundaries resulted in zero acres of gain each. Excluding the 15 sites with undetermined boundaries from our set of acreage calculations, the total acreage lost was 139.36, the total acreage required was 197.57, and the acreage "gained" was 226.12 acres, which exceeds the required acreage by 28.55 acres and yields a gain/loss ratio of 1.62:1.

These results suggest that, overall, mitigation projects in the Los Angeles region are meeting or slightly exceeding their acreage requirements. Therefore, it might be assumed that losses to wetlands and non-wetland waters permitted under Sections 401 and 404 of the Clean Water Act are being offset by adequate gains in acreage through compensatory mitigation requirements. However, a substantial proportion of these mitigation projects are enhancements and, to a lesser extent, preservation areas (which may increase or preserve function, but do not constitute gains in habitat). In addition, these results do not indicate whether the habitat type and ecological function lost at impact sites are being adequately replaced by comparable habitat and function at mitigation sites. These issues are discussed next.

The UCLA-CRAM functional evaluation method assessed 15 different metrics in four main categories of wetland functions or conditions. By assigning numerical values to the conditions for each metric, we were able to combine values to generate summary scores. The conditions at the 79 mitigation sites varied from 17% to 84% of the total possible UCLA-CRAM points (Figure ES2). Twenty-three of the 79 sites (29%) had scores less than 54.2% of the total possible points, considered to be marginal to poor wetland condition. Fifty-three of the 79 sites (67%) were of sub-optimal condition, and only three sites (4%) exceeded 79.2%, the criterion for optimal wetland condition. Figure ES3 presents the distribution of scores for each of the four components of the UCLA-CRAM assessment. For the landscape context component, 34 sites (43%) were marginal to poor and 7 sites (9%) were optimal. For the hydrology component, 18 sites (23%) were marginal to poor and 7 sites were optimal (9%). For the abiotic structure component, 29 sites (37%) were marginal to poor and 14 sites were optimal (18%). For the biotic structure component, 31 sites (39%) were marginal to poor and 7 sites were optimal (9%) with respect to wetland condition. These scores are summarized in Table ES2.

The UCLA-CRAM functional evaluation indicates that few mitigation projects resulted in optimal wetland conditions overall (4%), while nearly 30% resulted in marginal to poor wetlands. Similar results were found for each of the four components of the assessment, with the mitigation projects most successful in the abiotic structure category, but even here achieving only 18% optimality. Of course, not all compensatory mitigation projects include wetland hydrology, biogeochemistry, and hydrophytic vegetation as target endpoints. In these cases, a CRAM score of 100% may not be an appropriate expectation, since it is based on the premise that a high-functioning natural wetland will have high condition scores in all categories. On the other hand, since the principle behind the Clean Water Act regulation is protection of wetland functions and values, and because the regulatory framework is focused on wetland habitats, we feel that the target endpoint of a 100% CRAM score is an appropriate benchmark. CRAM evaluations of "best attainable wetlands" in the region and typical pre-project sites would enable us to put the UCLA-CRAM scores in a better context, but such investigations were beyond the scope of this project.

We extended the scope of CRAM's assessment through supplemental qualitative assessments. Included in this collection are estimates of plant density and diversity, total native cover and total cover of invasive species, and the percent cover of *Arundo donax*, a particularly troublesome invasive plant in the Los Angeles region. We also focus on one relevant stressor, the influence of impervious substrate on the sites. Additional assessments were made that focus on how successful the mitigation project was with respect to its potential longevity, its ability to persist without artificial watering, and the overall quality of the habitat. The final three assessments consider how successful the mitigation activities were in replacing lost function, how successful the permittees were in satisfying their permit obligations, and how appropriate those permit obligations were in guaranteeing that the goal of "no net loss" of remaining wetland habitat and function would be met, as approved. The main findings for selected supplemental assessments are presented in this Executive Summary, with the full set of supplemental assessments presented in the main body of the report.

The supplemental assessments indicate that most compensatory mitigation sites are achieving high success with respect to their plant communities. This confirms our general impression that the planting element of compensatory mitigation projects is the aspect of wetland replacement that both agency personnel and permittees focus on most.

For the “overall success of functional replacement” assessment, we considered what was actually accomplished at a mitigation site (the functional difference between the pre-mitigation state and post-mitigation state of the site) compared to the functional losses that likely occurred at the impact site (estimated through careful consideration of all available information regarding the site and project). Twenty three sites (29%) were successful, 10 sites (13%) were partially successful, while 46 sites (58%) were failures. The “overall success in achieving stated goals of mitigation plan/permit requirements” assessment considered whether or not the permittees adequately fulfilled their mitigation-related responsibilities, as outlined in the permits and mitigation plans approved by regulatory agencies. Forty two sites (53%) were considered successful, 10 sites (13%) were partially successful, and 27 sites (34%) were failing. Compared to the functional replacement assessment, the success scores for this assessment were higher by about 20 percentage points, indicating that many mitigation projects accomplished the goals set out for them but nonetheless failed to replace the lost functions from the impacted sites. From the results of these two assessments, one might conclude that the mitigation goals have not been set high enough to ensure that mitigation sites achieve the functions necessary to replace the impact site’s functions adequately.

At each mitigation site, we assessed the approximate proportions of jurisdictional and non-jurisdictional habitat types that would have been recorded had formal wetland delineations been made at the mitigation sites. The results indicate that nearly half of the acreage at compensatory mitigation sites consisted of non-jurisdictional riparian and upland habitat. Upland habitat and riparian habitat that is beyond the limits of federal jurisdiction (waters of the United States) are not included in the estimates of habitat losses that result from the formal permitting process. Nor are losses to these habitats considered when determining the acreage requirement of Section 404, or 401 permits (although the riparian habitats that are beyond federal jurisdiction may be considered “waters of the state,” and may thus be included in the acreage requirements of the California Department of Fish and Game Streambed Alteration Agreement). As a consequence, a simple balance-sheet approach to assessing no net loss, where acres impacted are compared to acres mitigated, can be misleading, since the loss acreage does not include non-waters habitats but the mitigation acreage does. A more complete accounting shows that a shift is occurring through the Section 401 permits whereby wetlands and other waters of the United States are being replaced to a certain extent by non-jurisdictional riparian and upland habitats. Jurisdictional wetlands themselves (as opposed to non-wetland jurisdictional habitat) appeared to have had a net gain in acreage through our 50 permit files. However, acreage gains were not evenly distributed among the permit files and over half of the files with wetlands impacts resulted in losses of wetland habitat. Our estimates of wetland habitat at mitigation sites represent the best-case scenario because we did not apply a strict three-parameter test, and the functions and services provided by these wetland habitats remains low.

Wetland protection under the Clean Water Act and the goal of "no net loss" is founded on the concept that wetlands and other "waters of the United States" provide valuable functions, values, and services that are important and beneficial to humans. Examples of such services include flood water storage, flood energy dissipation, biogeochemistry (e.g., water purification, nutrient cycling), sediment accumulation, wildlife habitat including aquatic wildlife habitat, and in some cases, groundwater recharge. To assess whether lost functions and services actually have been replaced by mitigation activities, we compared the services occurring at mitigation sites to what was lost through project impacts. For each of the services listed above (except ground water recharge, which is not relevant at most of our riverine sites), we considered what the realized gains were through mitigation activities and what the likely losses were at the impact sites. To analyze these data, we subtracted the loss score from the gain score for every service assessment, so zero represents complete replacement, negative numbers represent net losses, and positive numbers represent net gains. We will refer to the scale intervals as "service units." For each of the service category results given below, we consider success as meeting or exceeding full replacement (zero or higher score), and we consider failure as falling below a score of -1 service units. Partial replacement is defined as -1 service unit, or for the "totals" calculations, between this value and zero. Sites with service unit scores below -2 were considered "extreme failures."

The majority of the mitigation projects did not adequately compensate for services lost at the impact sites for five of the six types of services assessed; the one exception was flood energy dissipation, where 53% of the sites could be considered successful (zero or greater) at replacing the service (Table ES3). Replacement failed (< -1 score) at between 29% and 39% of the sites for the six services assessed. For each of the 79 mitigation sites, the data for the six types of services were averaged across all six categories to obtain a single value for services lost versus gained, per site. These results are presented in Figure ES4. As can be seen in this figure, the majority of the mitigation projects (66% or 52 sites) failed to compensate for the beneficial services lost through impact projects. Replacement could be considered successful for 27 sites (34%), with 20 sites (25%) achieving a net gain of services and seven sites (9%) having a net loss/gain of zero. Thirty-six sites (46%) failed to replace lost services, with 24 of these sites (30%) considered extreme failures.

A simple summary of mitigation success by acreage, permit conditions, and function is presented as a "by file" analysis (79 sites combined by 50 permit files) in Table ES4. Forty-six percent of permit files met or exceeded their acreage requirement and 60% successfully complied with their permit conditions. Among the files that had assessable permit conditions, all files met at least one assessable permit condition (and thus were judged partially successful), although 12 files (24%) failed to meet their acreage requirement. These results for acreage success are complicated by the fact that at a large percentage of sites, acreage determinations were not possible, either because the approximate boundaries of the site could not be determined or because no evidence of mitigation activities could be found. Even though the success rates for acreage and compliance were not high, the success rate for function was extremely low: only one site was considered successful with respect to function. Clearly, success in meeting permit conditions does not ensure mitigation site function.

Although overall the acreage of mitigation exceeded the acreage of impacts, there are differences in the habitat types impacted and required for mitigation. Data from this study show that a net loss of wetlands and waters has been replaced by a net gain in riparian areas and terrestrial habitats as well as in-lieu fee mitigation (Figure ES5). This figure shows the number of instances of the various habitat types lost compared to the number expected to be gained from an analysis of the information in the permit files. These analyses show the mitigation habitat types proposed and subsequently approved, but may not reflect the actual habitat types present at mitigation sites. Large discrepancies between impacted and mitigation habitats occurred for vegetated and unvegetated streambeds, with more impacted than mitigated, and riparian and terrestrial, with more mitigated than impacted. (There were also more "other wetland" habitats impacted than mitigated, but this difference is likely due to mitigation plans naming specific wetland types.) Thus, it appears that streambed habitats are not being replaced as often as they are impacted, while habitat outside of the streambed (riparian and terrestrial) are included as mitigation more often than they are being impacted. This will lead to a shift in the distribution of wetland types in the landscape.

Of 250 permit files we reviewed, 16% involved in lieu fee payments. Complexities inherent in the in-lieu fee program, as currently implemented, have resulted in numerous problems with respect to both permit compliance and the assurance that the goal of "no net loss" will be met. Key weaknesses in the in-lieu fee process include problems with the timeliness of fee transfers, substantial delays in the implementation of mitigation projects by the in-lieu fee program administrator, transfer of money to an agency general fund rather than to a specific mitigation action, and use of in-lieu fee payments for projects that do not replace lost functions and services appropriately.

The concept of the in-lieu fee program is valid. In-lieu fee programs can take advantage of economies of scale and the consolidation of small mitigation requirements into a larger effort that is more likely to succeed. However, compliance cannot be assured without adequate oversight and accounting, and "no net loss" will not be achieved unless appropriate mitigation projects are undertaken. The most difficult problems with in-lieu fee programs stem from the absence of a direct connection between the resources lost versus those gained from mitigation. Simple payment of fees facilitates the loss of this explicit link, exemplified by payments to a general program without any clear accounting for what the fees produced. In these situations, how can the amount of any particular fee payment (rather than a smaller or larger one) be justified? An explicit link between losses and gains is fundamental to the proper application of mitigation policy; in-lieu fee programs must be implemented in a way that maintains this link. Most current in-lieu fee arrangements do not.

In conclusion, the Section 401 has not achieved the goal of no net loss of habitat functions, values and services in the Los Angeles region. The root of this shortcoming lies with a lack of explicit consideration of the full suite of functions, values, and services that will be lost through proposed impacts and might be gained through proposed mitigation sites and activities. This begins with the drafting of compensatory mitigation proposals by permittees or their consultants that have little or no chance of meeting the "no net loss" goal. But ultimately it is manifested in the conditional approval of those mitigation measures by regulatory staff. There are certainly instances where inadequacies of subsequent mitigation plans, acreage shortfalls and other compliance issues contribute to net loss on an individual permit file basis. These problems frequently go unnoticed due to a lack of regulatory oversight and enforcement. However, our results demonstrate a much higher rate of success for compliance with permit conditions and acreage requirements than for replacement of lost wetland functions and services. Improving the protection of wetland resources will require a more careful scrutiny of mitigation plans to ensure they adequately replace lost habitat types, functions and services and the application of permit conditions that ensure that mitigation habitats provide appropriate functions and services.

The guidance document associated with this report discusses a number of the issues raised during our evaluation of 401 permits and provides a number of recommendations on ways the current Section 401 process might be improved to increase the success of compensatory mitigation.

Table ES1. 401 Permit Condition Analysis including the percent of sites where these conditions were specified and met (% of sites in compliance) and the percent of sites where these conditions were specified, but there was not enough evidence to determine whether they were met (% of sites where compliance was undeterminable). This analysis includes the 70 sites among 49 files at which 401 Permit Compliance was evaluated.

401 Permit Conditions	**% Met**	**% Not Met**	**% Undetermined**
Mitigation has been maintained in perpetuity?	72	16	12
Grading to pre-project contours?	88	0	12
Exotic plants absent?	16	84	0
Evidence of exotic plant removal?	41	41	18
Minor impact of exotics on site?	78	22	0
Is native vegetation present?	94	6	0
Is there evidence of restorative planting?	73	18	9
Presence of species specified for revegetation?	100	0	0

Table ES2. Summary of condition of wetland mitigation sites based on UCLA-CRAM scores. Data are percent of the 79 mitigation sites falling in each category. Optimal was >79.2% of possible points, suboptimal was <79.2% but >54.2% of possible points, and marginal to poor was <54.2%.

	Optimal	Suboptimal	Marginal to Poor
Overall	**4%**	**67%**	**29%**
Landscape context	9%	48%	43%
Hydrology	9%	68%	23%
Abiotic structure	18%	45%	37%
Biotic structure	9%	52%	39%

Table ES3. Summary of condition of wetland mitigation sites based on Services Lost versus Gained Assessment scores.

	Successful	Partially Successful	Failure
Overall	**34%**	**20%**	**46%**
Flood storage	42%	19%	39%
Flood energy dissipation	53%	14%	33%
Biogeochemistry	42%	24%	34%
Sediment accumulation	49%	14%	37%
Wildlife habitat	41%	21%	38%
Aquatic habitat	49%	22%	29%

Table ES4. Mitigation success by permit file. Data shown are percentages out of a total number of 50 permit files. The evaluation for 401 conditions was out of 55 files due to the inclusion of the 5 permits which had in-lieu fees paid that could not be tracked to specific mitigation projects. Numbers in parentheses are the actual number of sites within each category. For the UCLA-CRAM functional evaluation, success means "optimal wetland condition," partial success means "suboptimal" condition, and failure means "marginal to poor" condition. See the text for a full description of the success categories.

Category	Success	Partial Success	Failure	Cannot be Determined
Acreage Requirement	46 (23)	Not a category	24 (12)	30 (15)
401 Conditions	60 (33)	29 (16)	0 (0)	11 (6)
Mitigation Plan Conditions	44 (22)	34 (17)	0 (0)	22 (11)
Functional Evaluation	2 (1)	60 (30)	38 (19)	0 (0)

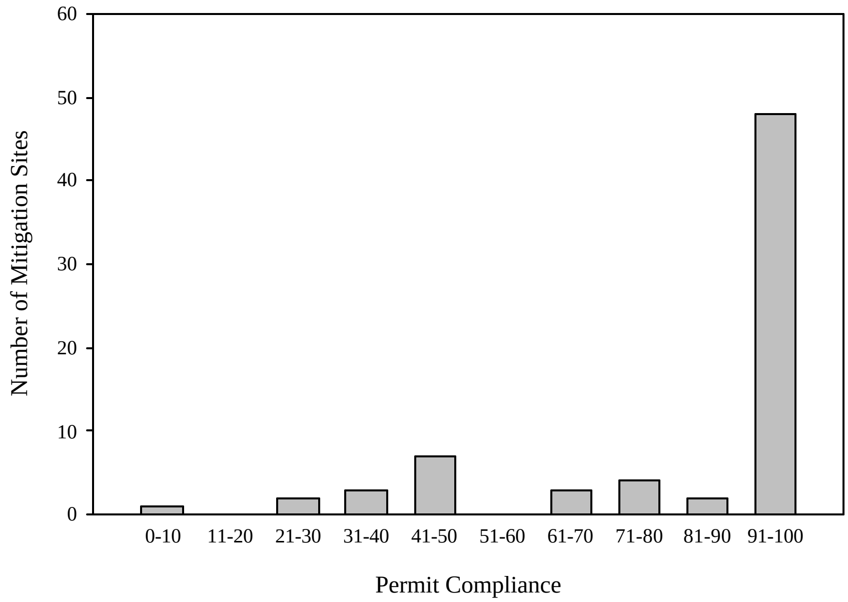

Figure ES1. 401 Permit Compliance histogram showing the percent of 401 Permit Conditions met for all of the files in the subset of fifty files evaluated fully and the five in -lieu fee files for which compliance could be determined ((N= 70 mitigation sites within 49 files). Fifteen sites did not have assessable permit conditions, therefore compliance was not calculated for them.

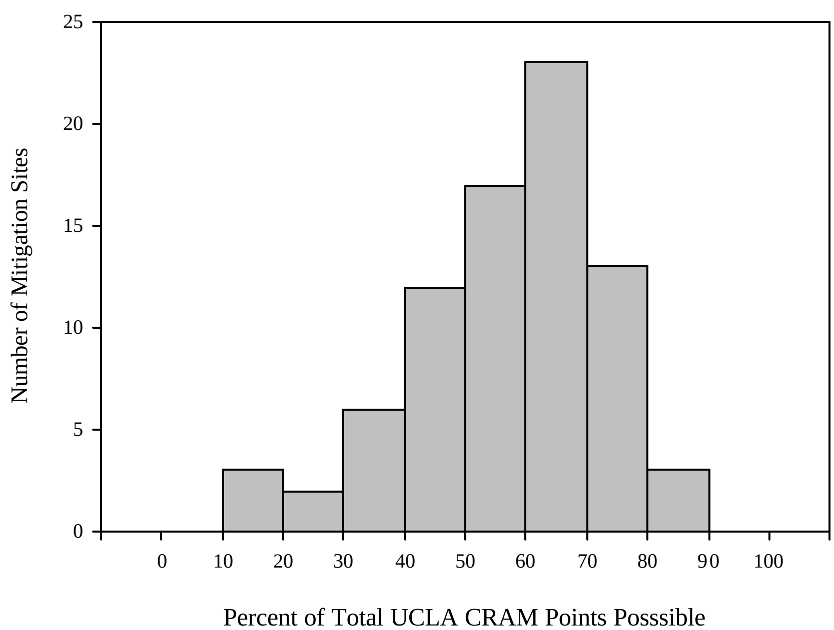

Figure ES2. UCLA -CRAM Totals – All Data. All data combined into a single functional success score for each of the 79 individual mitigation sites representing 50 files.

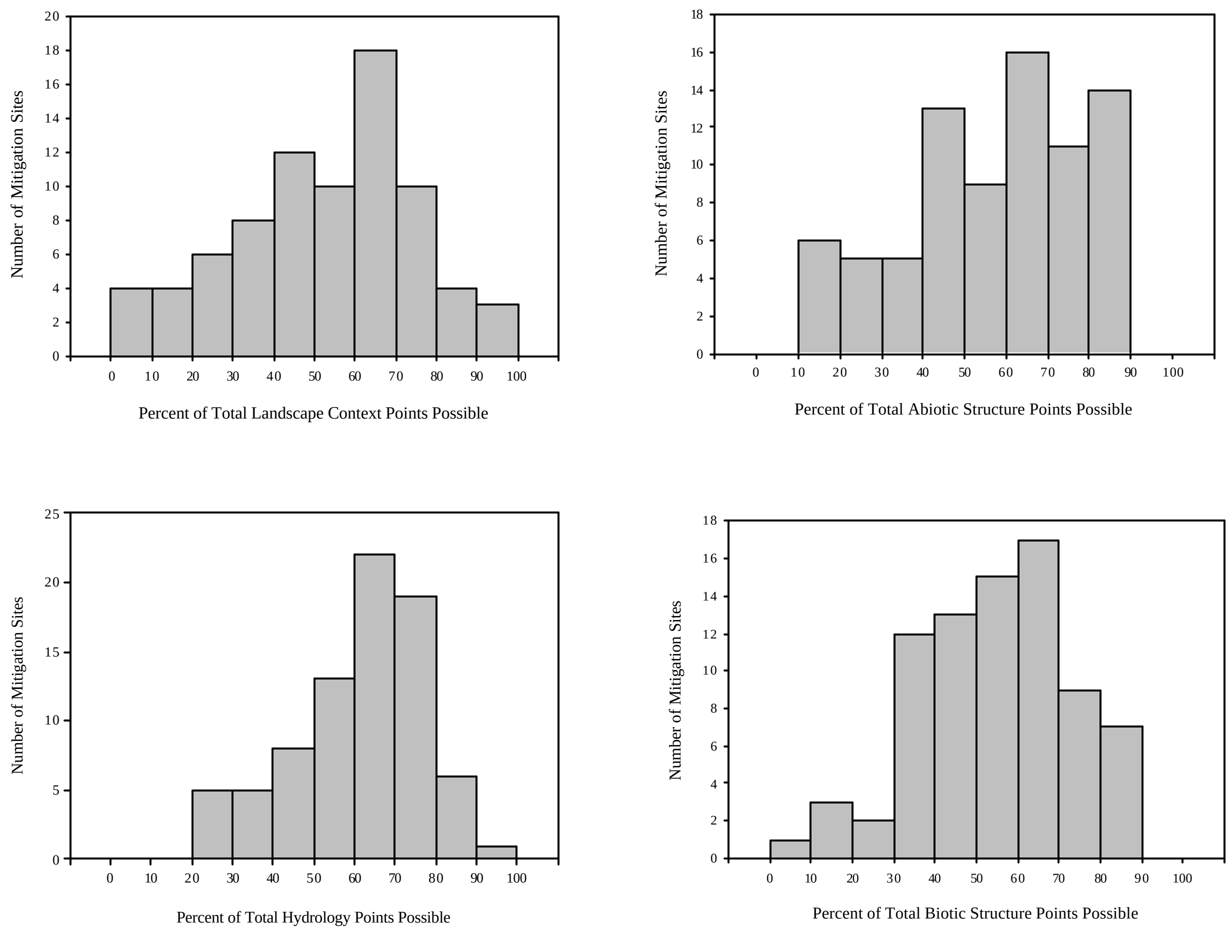

Figure ES3. UCLA CRAM Totals for four main functional categories. Landscape Context: All buffer extent, buffer width, buffer condition, and linear contiguity data combined into a single landscape context score. Hydrology: All water source, hydroperiod, and upland connection data combined into a single hydrology score. Abiotic Structure. All abiotic patch richness, topographic complexity, and sediment integrity data combined into a single abiotic structure score. Biotic Structure. All organic material accumulation, biotic patch richness, vertical structure, interspersion and zonation, and plant community integrity data combined into a single biotic structure score.

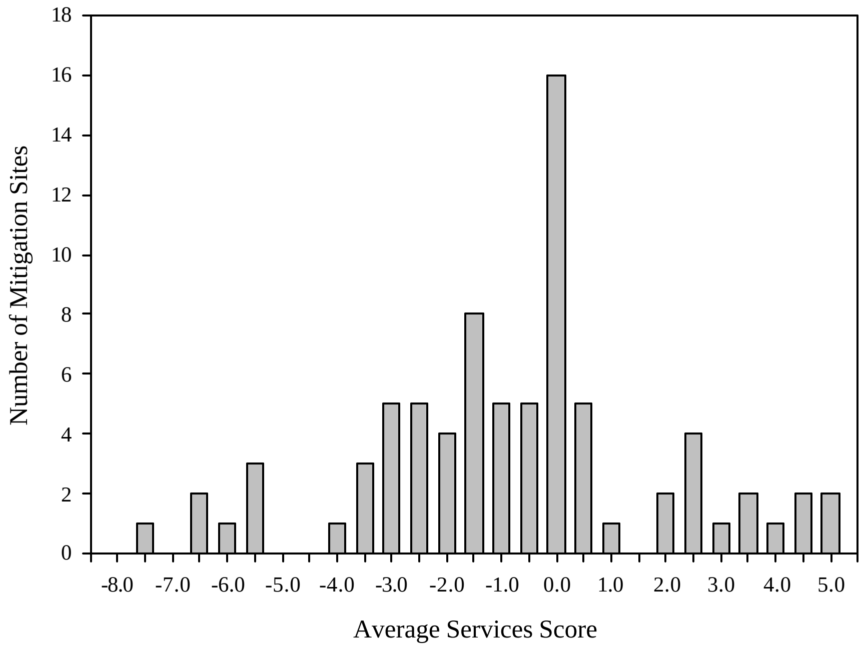

Figure ES4. Average Services Gained-Lost Scores across all services categories (Flood Storage, Flood Energy Dissipation, Biogeochemical, Sediment Accumulation, Wildlife Habitat, Aquatic Habitat) for all sites evaluated fully (N=79 mitigation sites within 50 files).

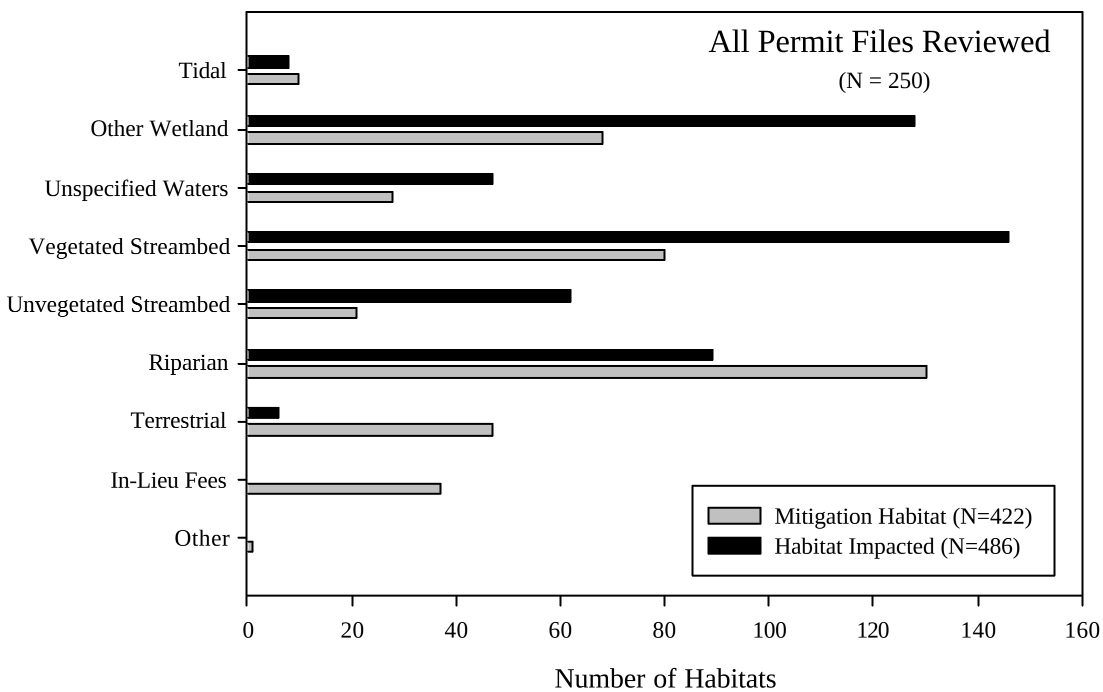

Figure ES5. Comparison of the habitat types lost at impact sites vs. habitats created, restored, enhanced, or preserved at mitigation sites for all 250 Permit Files reviewed in the initial phase of this project. Most permit files involve multiple habitat types at both impact and mitigation sites.

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1. Introduction

Mitigation for wetland impacts is an important aspect of the U.S. policy on wetland management. However, wetland mitigation has been the focus of many critical studies (see Race 1985, Zentner 1988, Kentula *et al.* 1992, Holland and Kentula 1992, DeWeese and Gould 1994, Miller 1995, Mitsch and Wilson 1996, Zedler 1996, Race and Fonseca 1996, Gilman 1998, Breaux and Serefiddin 1999, Ambrose 2000, Brown and Veneman 2001, Kelly 2001). Most recently, the National Academy of Sciences completed a comprehensive review of compensatory wetland mitigation in the U.S. (NRC 2001). The National Academy study found that mitigation goals are not being met because (1) there is little monitoring of permit compliance, and (2) the permit conditions used to establish mitigation success do not assure the establishment of wetland functions. For example, the National Academy found that mitigation compliance evaluated in 23 studies ranged from 4 to 100%, with a mean of 59% (Table 6-12, NRC 2001). Furthermore, in 11 studies assessing wetland functions, only 23% met various tests of ecological functionality or viability (Table 6-11, NRC 2001).

This project evaluated the compliance and wetland functions of wetland compensatory mitigation projects in Ventura and Los Angeles Counties. The projects were granted permits from the Los Angeles Regional Water Quality Control Board under Section 401 of the Clean Water Act. The assessment of mitigation projects included an extensive review of permit files followed by field monitoring to assess the condition of the habitat and map the area of the mitigation sites.

The work reported here follows from a number of previous studies focusing on Section 404 permits. Mary Kentula and her colleagues have conducted a series of studies exploring the effectiveness of Section 404 permitting in the United States (Kentula et al. 1992, Holland and Kentula 1992, Sifneos et al. 1992a, 1992b), including California. These studies relied solely on office reviews of permit files. In general, these studies have reported that Section 404 permits did not prevent continued loss of wetland habitat in the U.S. Permit file reviews are necessarily limited to the intent rather than actual implementation of mitigation. To remedy this limitation, a number of studies have assessed actual compliance with permits (see NRC 2001). In California, for example, DeWeese and Gould (1994) found 50% of the projects evaluated achieving at least 75% compliance with stated permit conditions, while Allen and Feddema (1996) identified a compliance rate of 67% in Southern California. Several studies have suggested that increased enforcement of mitigation permits would improve compliance with permit conditions (Holland and Kentula 1992, Sifneos et al. 1992a, DeWeese and Gould 1994).

A few studies have gone beyond compliance assessment to evaluate ecological condition or functions of mitigation sites. The NRC report summarizes 11 of these studies. The most relevant for our work was conducted by Mark Sudol in southern California (Sudol 1996, Sudol and Ambrose 2002). Sudol reviewed Section 404 and Section 10 permits for Orange County and conducted field assessments of each mitigation site to evaluate its compliance with permit conditions as well as how well the wetland performed certain functions (as indicated by the Hydrogeomorphic Assessment Methodology). Sudol found 18% of the mitigation sites complied fully with their permit conditions, but that none of the sites had appropriate levels of wetland functions. The combination of office review of permits with field assessments of permit compliance and wetland function is a powerful combination (Sudol and Ambrose 2002), and provided the model for the approach adopted in this study.

Although many previous studies focused on wetland mitigation projects required by permits under Section 404 of the Clean Water Act, Section 401 (the Water Quality Certification Program), administered by the Regional Boards in California, also requires the protection of wetland resources to ensure water quality. The Los Angeles Regional Water Quality Control Board has granted more than 1000 Water Quality Certifications (WQC) for hydro-modification projects since 1992. Between 1995 and 1999, approximately 128 acres of wetlands were certified to be filled (data prior to 1995 are not comprehensive). Surveys of wetland mitigation in other states, and a California Department of Fish and Game study, have shown that the majority of required mitigation did not occur at all, or was not successful. In order for the Regional Board to be successful at protecting, restoring, and creating wetlands, there must be a thorough understanding of what types of mitigation wetlands and riparian areas are successful in Southern California and why. The information gathered through this project will help the Regional Board determine when and where mitigation wetland sites are likely to fail and when alternative strategies such as mitigation banks might be recommended. It also provides information about successful mitigation sites and will help in determining an appropriate prioritization for proposed mitigation techniques.

2. History of the Contract

In 2002, the Los Angeles Regional Water Quality Control Board obtained a grant from the Environmental Protection Agency's Wetland Grant Program to evaluate the success of compensatory mitigation projects associated with water quality certifications issued under Clean Water Act Section 401. This important regulatory tool is one of the few available to the state with regard to protecting the diminishing acreage of wetland and riparian habitats in southern California. Section 401 certifications are issued by the Regional Boards, normally as part of the greater CWA Section 404 permit process. Statewide, the Section 401 program is significantly under-funded, with the activities of regulatory personnel being limited to the processing of applications. Since site visits, detailed reviews of mitigation plans and monitoring reports, and enforcement actions are not performed, the LARWQCB was concerned that the goal of "no net loss" of wetlands was not being met. Through this grant, they sought to determine if this was correct, and if so, identify the factors contributing to the lack of success.

The initial plan for this project called for a two-phase evaluation effort. Phase I was to involve an initial site reconnaissance visit at all 50 sites, including a permit compliance evaluation and a GPS-based survey of the site to determine mitigation project acreages. A subset of 25 sites were to be visited a second time to perform a functional evaluation (Phase II), which would be more time consuming than the reconnaissance visit. However, a substantial amount of time was required simply to understand the nature of the impact and mitigation projects and to pinpoint the precise location and boundaries of the mitigation site(s), given the frequent lack of detailed information in the permit files. In addition, much of the information needed for the functional assessment could be collected while determining the mitigation site boundaries, so we determined that it would be feasible to perform the functional assessment for all 50 files. We decided, therefore, to perform both the initial compliance assessment and the functional evaluation on the same day, rendering a second visit unnecessary. For files with multiple discrete mitigation projects, separate evaluations were performed at each site. As a result, we evaluated more than triple the number of sites planned for "Phase II," totaling 79 separate evaluations compared to the expected 25.

Further details about administration issues associated with this contract are given in Appendix 9: Contract Administration Issues.

3. Background

3.1. Definitions and Characteristics

Definitions of wetlands and riparian areas vary widely among different groups and for different purposes. The definitions used here are not based on regulatory requirements, but represent a general scientific consensus.

> *Wetland* – An ecosystem that depends on constant or recurrent, shallow inundation or saturation at or near the surface of the substrate, and the presence of physical, chemical, and biological features reflective of that regime, such as hydric soils and hydrophytic vegetation (adapted from NRC 1995).

A wetland is an ecosystem in which the presence of shallow water or saturation results in hydric soils and hydrophytic vegetation. Wetlands include freshwater marshes, tidal salt marshes, riverine floodplains, riparian wetlands, mangroves, and several types of depressional wetlands. These can be grouped into estuarine (tidal salt marshes), riverine (floodplains and riparian areas), lacustrine (lake affiliated), or palustrine (freshwater marshes and bogs). While the biological communities present at the various wetlands can take many forms, their predominant characteristic is the presence of often-dense water-loving vegetation. Wetlands in general are characterized by the presence of biophysical gradients between aquatic and terrestrial habitats.

> *Riparian Habitats* – Areas that are transitional between terrestrial and aquatic ecosystems and are distinguished by gradients in biophysical conditions, ecological processes, and biota. They are areas through which surface and subsurface hydrology connect waterbodies with their adjacent uplands (NRC 2002).

Riparian areas include those areas which are adjacent to perennial, intermittent, and ephemeral streams, lakes, or estuarine-marine shorelines. These are habitats that often line the margins or banks of streams and lakes, and are often characterized by the presence of low growing hydrophytic herbs, shrubs, and tall woody trees.

3.2. Functions and Services

Human activities have encroached on wetlands and river systems. Vast, low-lying riverine floodplains and coastal wetlands have been key targets for human development because of the relative ease of reclamation and because of their associated fertile soils. These complex drainage systems have often been reduced to straightened channels with tall constructed banks or levees, designed to contain high flood waters. In addition, isolated wetlands have commonly been drained and filled, or converted to livestock watering areas. The result of these impacts has been the diminishment of the beneficial services that these wetland habitats provide (NRC 1995; NRC 2001; NRC 2002; Leibowitz 2003), and humans are now beginning to recognize the consequences of their loss. The functions and services[1] that wetlands and riparian areas provide fall into three broad categories: hydrology and sediment dynamics, biogeochemistry and nutrient cycling, and habitat and food web support. Each wetland type performs characteristic functions; no particular wetland performs all possible functions. A brief description of wetland functions and services follows; this is a simple overview and not a detailed catalog of all functions and services performed by wetlands in the Los Angeles region.

3.2.1. Hydrologic Functions

The precipitation that falls on the earth has several possible fates. Much of that water is re-emitted to the atmosphere through direct evaporation or plant mediated transpiration. The remaining water either enters the earth's soil structure through infiltration, or becomes runoff as overland flow. Water flowing along the surface of the earth naturally flows downhill towards lower areas of the terrain, and begins to accumulate in rills, rivulets, streams, and ultimately river channels as it makes its way to the ocean. Water entering the earth will also flow down-gradient through the interstitial spaces in the soil or rock, eventually emerging back at the surface in topographically lower areas. These areas where the ground water table emerges are commonly adjacent to or within stream channels. The hydraulic connectivity between precipitation source areas and re-emergence areas results in increased groundwater contributions to streams following storm events, though there is usually a modest time lag and great modulation of flow. The combined flow from overland runoff and emerging groundwater following a storm event results in a pulsed stream discharge pattern with peak flood levels occurring some time after the point of maximum precipitation. Sediment is also a significant proportion of storm runoff as soil eroded from adjacent hillsides enters the stream along with the storm water (Knighton 1998). The destructive force of the storm flow reaches the maximum at the peak of discharge, and these peak flows are what human management strategies have tried to accommodate through the construction of tall levees and often-straight concrete channels. The general philosophy has been to move the water to the ocean as fast as possible, to minimize flooding during peak flows.

But the natural geomorphology of river channels has developed to accommodate these peak flows with appropriately wide floodplains and adjacent wetlands, which serve to modulate high water flow through the short term storage of water and sediment

[1] "Functions" refers to natural processes occurring in wetlands; "services" refers to processes or attributes of wetlands that are useful to humans.

(Knighton 1998). During high flow events, water flows over the banks of the natural channel and spreads out over floodplains, where the velocity is reduced and the sediment settles out. Water flows into the sediments within floodplains and riparian areas, where it is stored until the flow recedes. Then the water slowly flows back out during periods of low flow, helping to maintain baseflow conditions during the dry season. Isolated depressional wetlands collect some of the water that would otherwise flow directly to the stream, thus contributing to the moderation of storm flow and the recharge of ground water. In addition, the vegetation that occurs on floodplains and in riparian zones provides mechanical flow reduction and energy dissipation of high flow, and riparian trees, shrubs, and grasses contribute to the stabilization of the stream banks. Often, the absence of riparian vegetation on the banks can lead the destabilization of the banks and their subsequent erosion and incision, though the presence of riparian trees may contribute to bank erosion in other circumstances (Lyons et al. 2000).

3.2.2. Biogeochemical Functions

Biogeochemical functions in wetlands and riparian areas include the retention and removal of substances from the water, sediment accumulation, and nutrient cycling, among others. All of these result in the overall maintenance of water quality. For example, a riparian buffer zone located between an agricultural area and a stream channel can absorb much of the nutrients leaching from a nearby agricultural field through either surface flow or through the groundwater (NRC 2002). These nutrients can become adsorbed by hydric riparian soils or may be assimilated by riparian vegetation, thus minimizing their transport to the stream. In many agricultural areas, the absence of a riparian buffer may result in direct inputs of nutrients to the stream, in which case instream wetland conditions become very important with respect to improving water quality. Many biogeochemical reactions are redox dependent. That is, certain reactions occur in the presence of oxygen while others require the absence of oxygen. Many of the beneficial reactions that contribute to the improvement of water quality require the absence of oxygen and are common in anaerobic wetland soils.

3.2.3. Ecological Functions

When most people consider the importance of wetlands, they immediately think of their use by migratory waterfowl. In fact, wetlands are extremely important habitats for migratory birds, which use them for resting and feeding areas as they travel from place to place or for breeding. But wetlands and riparian areas are important to many other species of plants and animals as well, including threatened and endangered species, and can be areas of notably high biodiversity. For example, riparian habitats in the Santa Monica Mountains cover less than 1% of the land area yet are the primary habitat for 20% of the higher plant species (Rundel 2002). In today's heavily fragmented landscape, riparian areas can be extremely important corridors for the movement of animals. Many isolated wetlands that become dry during part of the year means cannot support fish species, making them important habitats for reptiles and amphibians that would otherwise be preyed upon by fish (Gibbons 2003). Further, riparian trees and other vegetation perform important shading functions, providing significant thermal regulation for the community by keeping water and air temperatures cool during warm dry periods.

3.3. The Protection of Wetlands

When Europeans first arrived in North America, the vast amount of dense woodland and wetland habitat constituted substantial impediments to the settlement of the land (Hawke 1989). Throughout most of our nation's history, the federal government actively encouraged the conversion of wetlands for useful purposes and for disease abatement, as evidenced by legislation such as the Federal Swamp Land Act of 1850, which promoted their conversion to agricultural land (NRC 1995). The notion that wetlands perform functions or services that can be beneficial to the greater human society has only taken root within the last several decades, and is still not understood by many. However, the environmental movement of the late 1960's resulted in a suite of landmark environmental laws to protect our nation's natural resources from further degradation. Among these was the Clean Water Act, which had the ambitious goal "to protect the physical, chemical and biological integrity of the nation's waters" (NRC 2001).

While the main focus of the Clean Water Act was to prevent water pollution, some aspects of this law extended protection to wetlands and these remain the most important federal protections for wetlands today. Wetland protections came primarily under Section 404 of the CWA, in which the U.S. Army Corps of Engineers was made responsible for regulating the discharge of dredged or fill material into "waters of the United States," including wetlands, under the general oversight of the EPA. But while water and air generally move over tracts of land, wetlands themselves are often located wholly or partially on privately owned land. This aspect of wetland regulations have made them some of the most contentious elements of environmental law to date (NRC 1995), and the resulting protection of wetland habitat has fallen short of the goals set forth in the Clean Water Act (NRC 2001).

By the mid 1980's, wetland declines were so severe that nationwide, approximately 117 million acres of wetland had been lost, about half the original amount (NRC 1995). In California, declines were much more severe with losses estimated to be about 90%. Recognizing this problem, and given the refined understanding of the importance of wetland functions, the EPA called for a National Wetlands Policy Forum in 1987, and asked the participants to make national policy suggestions for the future of wetland protection. The central recommendation of the panel was to create a policy of "no net loss" of remaining wetlands, and that restoration and creation practices should be employed to offset losses permitted under CWA Section 404 (NRC 2001).

In 1990, the first Bush administration adopted this policy of no net loss. Later that year the Corps and EPA produced a guidance document that instructed regulatory personnel how to implement compensatory mitigation requirements (see below) within their 404 permit program (NRC 2001). In 1991, the first permit was issued that required compensatory mitigation to offset the wetland habitat lost under Section 404 of the Clean Water Act. It should be noted that many states have implemented similar legislation within their state legal structure. For example, California has the California Environmental Quality Act (CEQA) and the Porter-Cologne Act, which are state versions of NEPA and the CWA respectively.

3.4. Clean Water Act Section 404

Section 404 of the Clean Water Act prohibits the discharge of dredged or fill material such as sand or soil into waters of the United States, unless a permit is issued under the regulatory authority of the U.S. Army Corps of Engineers. Therefore, if an individual, a corporation, or a governmental entity has a project that requires the discharge of fill into a stream channel or a wetland, they must first apply for a permit to do so. A permit will be issued if it is deemed to be in the best interests of society. The great majority of permits are ultimately approved (NRC 2001). While some projects must be evaluated and permitted on an individual basis, others may fall into more general categories, such as bank stabilization or the maintenance of bridge over-crossings. Numerous regional or nationwide permit categories are available for such projects, which can help to streamline the approval process. In all cases, the Corps personnel must follow a standard sequence in their decision making process. They must first determine if different strategies could be employed in which all or some of the proposed impacts might be avoided or minimized. Given the national goal of "no net loss," any remaining impacts must be compensated for by creating, restoring, or preserving wetlands or waters in another location (NRC 2001). This is termed *compensatory mitigation*.

With respect to compensatory mitigation, agency guidance documents and regulatory personnel have traditionally preferred nearby, like kind mitigation to offset losses. But land is expensive and most land owners have few options available for potential mitigation sites. Furthermore, the Corps cannot force a land owner to pay an excessive sum of money to purchase additional land, if that expenditure would render the original project unviable. Many mitigation projects have involved the creation of new wetland habitat on upper portions of degraded banks, or at other locations that lack a hydrological connection to the waterway. These are often kept wet by artificial irrigation that will likely be discontinued at the end of the normal five-year permit review period. Recognizing the shortcomings of such permittee-responsible mitigation, regulators have begun favoring the use of alternative third-party strategies such as *mitigation banks* and *in-lieu fee programs* where mitigation is off-site (NRC 2001).

Mitigation banks are sites where a large restoration, creation, or enhancement project, is undertaken to provide compensatory mitigation in advance of projects that will create wetland losses[2]. Credits from these projects can be used to offset losses (debits) permitted under Section 404 on an acreage basis. Mitigation banks may be established by entities that anticipate having large numbers of future permit applications, or by third parties that wish to sell their credits for a profit. In-lieu fees are payments made to natural resource management entities for implementation of either specific or general wetland development projects[3]. Mitigation banks have the benefit of avoiding temporal losses of wetland habitat that occur between the time the actual loss occurs at the impact site and the point where complete function is restored at the mitigation site. In-lieu fee programs may or may not avoid temporal losses. But both of these third-party

[2] Of course, there are many variations on this general description, a common variant being allowing credits from a mitigation bank before it is completed and demonstrated to be successful.

[3] In the past, in-lieu fees were not necessarily restricted to natural resource management, and as a result became a controversial form of mitigation.

approaches have the potential to restore large areas of relatively high quality contiguous wetland habitat that may be better situated in a landscape context than individual mitigation projects, being placed in proximity to existing functional wetland habitat.

Most often, the amount of mitigation required is not a simple one-acre mitigated for one-acre lost ratio (NRC 2001). This is to account for temporal losses and incomplete replacement of function. Therefore, mitigation ratios of 2:1, 3:1, or greater are sometimes required. These required ratios have been increasing through recent years, as regulatory personnel have become increasingly aware of continued wetland losses.

The Section 404 permit process is quite complex (NRC 2001). This process usually begins with a pre-application meeting between the permittee and Corps regulatory personnel in which the likelihood of the project's approval is evaluated and the permit is reviewed for completeness. Once the permit is submitted and it is deemed complete, it is subjected to public review and is distributed to all agencies whose jurisdiction the permit falls under, such as the EPA, the U.S. Fish and Wildlife Service, the U.S. Coast Guard and the National Marine Fisheries Service. If the project gains the conditional approval of these entities, it is then subjected to formal alternatives analysis (avoid, minimize, compensate) under the guidelines set forth in CWA Section 404(b)(1), and then is scrutinized for compliance with NEPA, and with all other related laws. In California, these other laws include, at minimum, the following two elements: (1) A *state water quality certification* required under CWA Section 401, which is issued by the appropriate Regional Water Quality Control Board. This document certifies that the project will not adversely impact water quality, or if it does, those impacts will be mitigated. (2) A California Department of Fish and Game (DFG) *streambed alteration agreement*, which ensures that a project does not adversely impact the local fish and wildlife, or if it does, those impacts are mitigated. These mitigation requirements are distinct from those required by the Corps. Once all approvals are met, the Corps will issue the permit.

Thus, the Section 404 permit could more appropriately be viewed as a process that results in a collection of related permits. The components of a typical Section 404 permit include the 404 permit itself, issued by the Corps, the Section 401 water quality certification letter (401 permit), issued by the Regional Water Quality Control Board, and the streambed alteration agreement (1600 permit), issued by the California DFG. Other agency requirements may be necessary, such as a coastal zone development permit (issued by the California Coastal Commission) if the project occurs within the coastal zone. This is relevant because given their unique jurisdictions, each regulatory agency will require a specific set of conditions, a specific mitigation ratio, and a specific set of performance standards that the permittee must satisfy in order to gain the final approval for their project. Performance standards are specific criteria such as native tree density, percent areal canopy cover, percent survivorship after two growing seasons, and so forth. These are precise conditions that must be met or exceeded during the construction or monitoring phases of a mitigation project (NRC 2001). After reviewing these permit conditions, the permittee must create a mitigation plan for a compensatory mitigation project that satisfies all of the agency requirements, and this mitigation plan is the final component of the permit.

The jurisdictional limits of these three key regulatory agencies are such that the Corps itself has less regulatory control over potential impacts than the two state agencies. The jurisdiction of the Corps is limited to those areas within the "ordinary high water mark" of waters of the U.S. (http://www.spl.usace.army.mil/). In streams, this generally occurs at some height along the banks and accounts for only a portion of the riparian area. The jurisdictional limits of the California DFG are broader, extending to "the outer drip line of the riparian vegetation." The jurisdiction of the Regional Board is less clearly defined. Operating under federal law, the state must follow the jurisdiction of the Corps, but under the Porter-Cologne Act, California assumes much greater authority to consider all relevant impacts that affect water quality (http://www.swrcb.ca.gov/~rwqcb4/). The Corps generally requires the lowest mitigation ratio, normally 2:1, while the Regional Board and the DFG may require more, given that they can consider impacts or losses to a greater total area. Since the DFG can consider impacts to riparian habitats that are beyond federal jurisdiction of "waters," DFG requirements typically require mitigation sites to contain appropriate acreage of "non-waters" habitat. Additionally, since the DFG *streambed alteration agreement* contains the greatest specificity with respect to best management practices and performance standards, this aspect of the greater Section 404 permitting process usually becomes the focal point of the mitigation plan.

3.5. Assessing mitigation success

Once a permit is issued, there is generally little follow up on what happened at either the impact site or the mitigation site. This is because there are so few regulatory staff, and so many permit applications (NRC 2001). Mitigation reports are supposed to be submitted by the permittee throughout the five year certification period, but often are not. In addition, record keeping has been identified as an impediment to assessing mitigation practices, with incomplete files and inadequate database tracking systems (NRC 2001). Few determinations of the success of compensatory mitigation projects occurred during the first decade of their existence (NRC 2001). Determining mitigation compliance can be difficult, however. Following an initial permit review and site visit, one must decide whether or not the permit conditions were met. This assessment would evaluate if the project was, in fact, undertaken, if the actual acreage matched what was proposed, and if the specified performance standards were met. This last point is important and highlights one of the main flaws in the 404 program. In planning and executing a compensatory mitigation project, the permittee's sole focus is usually to satisfy permit conditions. As long as the permittee can demonstrate that the performance standards set forth in the permit have been met, their obligations have been fulfilled. As yet, aspects of wetland function have not been significantly addressed in these performance standards, and this is because of the legal difficulties in assigning specific targets for function (NRC 2001). The performance standards that have been included were meant to be proxies for function, but given the limits of their application, true hydrological, biogeochemical, and ecological function have remained elusive.

Data reported by the Army Corps of Engineers indicate that the goal of "no net loss" is not only being met, but is being exceeded. According to the Corps, from 1993 through 2000, approximately 24,000 acres of wetland losses were permitted, while 42,000 acres were created through compensatory mitigation (NRC 2001). Thus an average mitigation ratio of 1.8:1 has been achieved. But these statements of mitigation success and the achievement of no net loss have been based solely on the amount of mitigation required in the permits, not on any evaluation of wetland function present at mitigation sites. One recent study that employed functional assessment methods to evaluate the success of the Section 404 permitting program, conservatively estimated that only 55% of mitigation sites met permit conditions, while only 16% of the sites could be considered successful (Sudol and Ambrose 2002).

These data suggest that the success of the Clean Water Act and the “no net loss” policy has not succeeded in preserving our nation’s remaining wetlands. It is impossible, however, to determine the extent of wetland losses that would have occurred in the absence of the Section 404 program. It is possible that this regulatory program has prevented the loss of substantial wetland habitat due to its mere existence, and through the sequencing process.

4. Methods

4.1. Permit Review

The central goal of this project was to assess compliance and function of a set of mitigation projects required by the Los Angeles Regional Water Quality Control Board (LARWQCB) under Section 401 of the Clean Water Act. An early task, then, was to select the permits to review, which required reviewing the physical files. Initially, we considered using the file tracking databases from the LARWQCB and the State Water Resources Control Board (SWRCB). However, after comparing the information in these two databases, and especially to the information we found in our preliminary reviews of the LARWQCB file archives, we determined that substantial inconsistencies exist between each of these sources (Table 1). In searching the LARWQCB file archives, we found numerous examples of permits that were issued but were not in either of the agency databases. More importantly, the organization of the file archives (see below) would have made it impossible to locate a particular file without extensive searching through archive boxes. Thus, we determined that neither the LARWQCB nor the SWRCB file tracking database would be useful for selecting projects for this study; instead, we selected files based on a physical review of files.

The file review was primarily conducted at the LARWQCB office. The LARWQCB file archive consists of permit files in over 200 storage boxes. The files in a particular box were usually related by year; occasionally, a storage box had a “contents” sheet affixed to its lid. However, there was no overall organizational scheme to these files, making it difficult for LARWQCB staff to find a file if it needed to be updated. Until recently, it was unlikely that correspondence, mitigation reports, or copies of permits issued by the other regulatory agencies could be added to the appropriate file once it was placed in a storage box. To account for this, the LARWQCB began maintaining a set of “compliance files” in a more convenient location. While the original file paperwork continues to be stored in the basement archives, mitigation reports and other correspondence are placed in a separate file as they arrive to facilitate review and enforcement.

We initially hoped to perform a complete survey of all the LARWQCB file archives, and accordingly started reviewing haphazardly selected boxes. However, after performing an initial review of about 50 files, we realized that time constraints would prohibit us from doing so. Instead, we sought to complete a permit review with files stratified by year, with at least 20 permit files requiring compensatory mitigation per year from 1990 to 2003. Because no files could be located from 1990, and 2003 files proved too recent to be assessable, these years were removed from the study. Once we achieved 20 files from a given year, any subsequent box that appeared to contain files from that year would be avoided. However, to avoid bias, once we decided to review the contents of a particular box, all files of that box were reviewed. For some of the earlier years we were never able to locate the targeted 20 permit files requiring mitigation.

Since key documents were frequently absent from the LARWQCB files, we supplemented our file survey by reviewing the file archives at the United States Army Corps of Engineers office in Ventura. The organization of their permit filing system was more tractable, and the files themselves were more complete, usually with all agency permits and with more mitigation reports. As we went through each box, the basic information from nearly 900 permit files was recorded. For 250 of the over 300 files that contained mitigation requirements, photocopies of all pertinent information were made to facilitate our office and field assessments. The documents photocopied include those relating to Section 401, Section 404, and the Streambed Alteration Agreements, plus mitigation plans, mitigation reports, and any other substantive information or correspondence.

4.2. Data Management

Neither the SWRCB nor the LARWQCB Microsoft Access database was deemed appropriate for use in the data entry and management of our permit file information; not only were both databases incomplete (see above), but our project required many fields not present in the Water Board databases, including information on enforceable permit conditions. A new Access database was designed specifically for use on this project. Information from all 250 photocopied files was entered into this database, including basic project data, permittee, agent, location, impacts and mitigation. In addition, we added a section for the permit conditions extracted from the permit files.

Permit files at the LARWQCB are identified by a unique project title, and by a five digit permit number such as 98-023 that identifies the year the permit was initiated and the order in which it was received. This numerical system was not initiated until 1995, and earlier permits were simply identified by the project title. Because we needed a discrete number to identify these files in our database, we assigned these early files a similarly formatted, but four digit number, such as 93-15, that would be easily recognized as distinct from the LARWQCB numbering system

The Access database containing all of the permit review information included information from selected files regarding the all the required permit conditions. This enabled forms containing all the relevant permit information including these requirements to be printed for use as compliance data forms. All data collected through our office and field assessment of compliance, as well as all primary and supplemental data collected through the functional evaluations, were entered into this Access database. The GPS data were managed separately, as described below. Data extracted from queries of the Access database were typically imported into Microsoft Excel for processing, and later graphed using SigmaPlot. Tables were created in Microsoft Word.

4.3. Site Selection

Fifty permit files to be included in our compliance and functional evaluations were selected randomly from the total population of 250 files with mitigation requirements. The distribution of project size for these 50 files was compared to the distribution for the total population of 250 files to ensure that our sample adequately reflected the range of project sizes permitted. Through this comparison, we found that large projects (10+ acres) were inadequately represented in our sample, so we augmented our sample accordingly. In addition, files that consisted entirely of obscure forms of mitigation such as atypical terrestrial habitats were eliminated because we wanted our sample to be representative of the typical mitigation required by the RWQCB; when these were combined with more typical forms of mitigation, the file was not eliminated. As additional files were eliminated based on our intensive office and field assessments, new randomly selected files were added to the list until a set of 50 fully assessable files was identified (Table 7). Full descriptions of these permit files, including impact and mitigation activities, are given in Appendix 5: Site Narratives.

4.4. Office Assessments

For each of the randomly selected permit files, an initial review of the file paperwork was performed prior to the field visit to gain a general understanding of both the impact project and the expected mitigation activities. When available, mitigation plans and mitigation reports were consulted, both to facilitate the familiarization process and to extract any potential information that would be useful for the compliance evaluation. Often, correspondence with regulatory personnel, the permittee, the permittee's consultant, or the in-lieu fee recipient was necessary to resolve site access issues, to determine if the impact or mitigation projects were undertaken, or to verify fee payments. Office evaluations are a significant element of the CRAM methodology (discussed below), intended to improve the understanding of the landscape context of the site, including the surrounding land uses and the stressors associated with those land uses, and to help identify the boundaries of the assessment area. This did not prove to be necessary for our study of mitigation sites because we were already familiar with most of the local watersheds and because boundary determinations of often-small mitigation sites can only be determined in the field. However, we did obtain web based aerial photographs (http://terraserver.microsoft.com/) of the expected mitigation sites, when available, to assist in our site evaluations. While these office assessments were useful, the greatest understanding of the project came only upon visiting the site.

4.5. Site Visits

As stated earlier, we combined the Phase I compliance evaluations and the Phase II functional evaluation into a single site visit, though follow-up visits were sometimes necessary. Upon arrival at the general project area or the expected mitigation site location, we looked for evidence of mitigation activities such as recent plantings, irrigation systems or disturbed earth to confirm the presence of the site. Occasionally, we found no evidence that the impact or mitigation project occurred, or that the impact project was currently under construction and the mitigation activities had not yet been initiated. It was also common, especially with the newer permits, that the impact project had occurred, but the construction of the mitigation site was still under way. There were a few instances where the impact project had been completed, but we found no evidence suggesting that the required mitigation had occurred. In all of these cases the file was removed from our list of 50 assessed files, but a record of these sites was made. The list of all such files including the reason they were excluded is given in Table 5. In addition to these excluded permit files, there were five files for which compliance evaluations could be made, but where functional evaluations were not possible because of ambiguities inherent in the in-lieu fee process (Table 6). Because we wanted a set of 50 fully assessed (Phase I and Phase II) files, an additional five files were added, resulting in a total of 55 files evaluated for compliance. For each of the fully assessed files a considerable amount of time was spent onsite deciphering the language of the permit file paperwork to understand the nature of the impacts, to identify all discrete mitigation projects involved, to identify and map the boundaries of those discrete projects, and to perform our compliance, functional and supplemental evaluations. This key information was often not readily apparent in the permit files.

4.6. Acreage Determinations using GPS

We originally planned to map mitigation site boundaries to determine acreage compliance by walking the project perimeters with our mapping grade GPS; after differentially correcting the data, we would simply record the acreage value and compare this number to the required acreage as stated in the permit. However, acreage determinations for compensatory mitigation projects are not simple to determine. The reasons for this are varied and numerous, but for the most part are related to ambiguities among mitigation habitat types, and the absence of site positioning information (i.e. GPS surveys of mitigation sites). To fulfill the acreage requirements mandated by the regulatory agencies, and given the resource limitations of the typical permittee, an individual permit file may have from one to four discrete mitigation project sites that may blend together several different habitat types (e.g., wetlands, alluvial scrub, riparian areas, etc.), and multiple mitigation actions (e.g., restoration, enhancement, and preservation). Where possible, we distinguished between discrete mitigation sites, and these were surveyed and evaluated separately. Of the fifty permit files we assessed, 20 files had multiple discrete mitigation project types that yielded 79 individual mitigation site evaluations.

Frequently, we were unable to determine even the approximate boundaries of a mitigation site. This was common with, but not limited to, re-vegetation projects on active channel floodplains. In such cases, from evidence of mitigation activities at the expected site location and/or through information gleaned from the permit files, we were able to confirm the general location of the mitigation site. However, when the evidence of mitigation activities was scant or absent, and when these activities blended into the surrounding landscape, it was not possible to delineate the perimeter of the project site. Since area determinations could not be made, only single GPS points were taken at these sites to identify the approximate location of the site and our corresponding evaluations. Even where site boundaries could be determined, they were usually not clearly delineated as they transitioned into the surrounding landscape. GPS coordinates of mitigation sites were almost never available in the permit files, and stakes, flags or other survey markers were seldom present. To compensate for this, we made our estimates of mitigation site acreage quite liberal, in order to avoid falsely claiming that the mitigation acreage was inadequate. That is, we walked the widest boundary possible as determined by disturbed earth, irrigation systems or obvious vegetation plantings to provide the "best case" acreage estimate possible. It should be noted here that the target acreage outlined in the mitigation plan is intended to compensate for all agency requirements (including the Army Corps, and CA Dept. of Fish and Game), and often exceeds that required by the 401 permit alone.

Where possible, GPS data were collected at the mitigation sites with a Trimble Pro XR GPS receiver and a TSCE handheld interface. These data were downloaded to office computers and managed using Trimble's Pathfinder Office v2.9 software. GPS data were differentially corrected using data collected from the base station provider that was nearest to the mitigation site, as determined by an automated internet search (Appendix 6: GPS Information). The resulting corrected files were exported as shape files and all remaining steps were performed within ArcMap v8.3. Much of the specific GPS information we acquired is tangential to our goal of obtaining acreage estimates for each of the sites, but for completeness is provided in Appendix 6: GPS Information. This appendix includes a table of the rough GPS coordinates of all of the mitigation sites, information on the details of the post-processing computational steps taken to arrive at our final acreage estimates, a list of the base station providers that were used to differentially correct the data files; we are also delivering to the LARWQCB a compact disc containing all of the computer files associated with this project. Many of the area polygons collected in the field had to be adjusted to account for ambiguities in the site perimeters that were later resolved; features or sub-areas within the perimeters that could not justifiably be included as mitigation were subtracted from their encompassing area polygons. Additionally, difficult terrain and/or dense vegetation made particular sites difficult to traverse, or otherwise rendered GPS area functions inappropriate. In such cases GPS points or lines were collected at numerous locations around a site, and these were later combined on the computer to yield new or adjusted area polygons. All such manipulations were performed and explained in a way that maintained full transparency between the source data files and the resulting ArcGIS files, a full accounting of which is provided in Appendix 6: GPS Information. The outcome of these efforts was the creation of a single GIS layer containing all mitigation site information, which was overlaid onto a regional map to show both the precise and the relative position of these sites within the jurisdictional boundaries of the LARWQCB (Figure 1).

4.7. Compliance Evaluations (Phase I)

Each permit file has a series of standard and special conditions associated with it that specify management actions or performance standards that must be accomplished in order to meet the compliance requirements of the permit. We define compliance as the percent of conditions met, as determined through our field and/or office assessment.

Throughout the years covered by this project, the standard and special conditions included in the LARWQCB 401 permits have changed, becoming more inclusive and more specific. A complete listing of all the standard and special conditions found within the 50 Section 401 permit files included in this study, including common conditions and uncommon conditions, is given in Appendix 7: 401 Permit Conditions. While our compliance evaluation focused on the conditions that were specified in the approved permit, at the request of the LARWQCB we included a separate assessment to evaluate how well each permit met the set of "modern" conditions typically required in the more recent permits, as if those modern conditions had been required. We determined the "modern" conditions based on our intensive review of the LARWQCB permit files and what conditions were recently being specified for similar projects.

In addition to the conditions issued by the Regional Board for 401 permits, additional conditions were required in the permits issued by other regulatory agencies (e.g. 404 and 1600). To address the compliance with this total set of permit conditions, we evaluated success in meeting the criteria set forth in the mitigation plan (when available), as this plan is designed to accommodate the requirements of all agencies.

Thus, three separate compliance evaluations were made for each of the sites: 401 conditions, modern 401 conditions, and mitigation plan conditions. For files with multiple mitigation sites, we evaluated compliance at each mitigation site separately, resulting in 79 field compliance evaluations. These were combined with the five permit files containing non-tractable in-lieu fee payments for a total of 84 individual compliance evaluations.

It should be noted that, of the set of standard or special conditions specified in the typical permit, a subset of conditions often could not be assessed because of the age of the site or the nature of the condition. For example, it was not be possible to determine if mulching was performed on a site that was 12 years old[4]. The compliance evaluation below is restricted to those conditions that could be assessed through our office or field surveys. It should also be noted that the standard and special conditions that could be assessed were typically management actions, rather than performance standards. It is unclear whether the failure to meet these conditions would necessarily result in a failure to meet the appropriate performance standards.

4.8. Functional Evaluations (Phase II)

4.8.1. California Rapid Assessment Method (CRAM)

Although a functional evaluation of Phase II mitigation sites was required, the specific evaluation technique was not specified in our contract. However, discussion with LARWQCB and State Water Resources Control Board staff identified the California Rapid Assessment Method (CRAM) as a likely candidate. Before settling on this method, however, we explored other alternatives. Coincidentally, Fennessy et al. (2004) had just completed an extensive review of rapid methods developed for assessing the

[4] Some of these conditions could have been assessed if comprehensive monitoring reports were available (as was generally required); however, the majority of permit files lacked the relevant monitoring reports.

conditions of wetlands in the United States, and this review was consulted. In addition, we reviewed a number of other approaches; a partial but annotated summary of some of the relevant literature is given in Appendix 1: Review of existing wetland assessment methods. Following this review, and in consultation with LARWQCB staff, we decided to use CRAM as the core of the functional assessment.

At the time of this study, CRAM (whose southern California development is led by Southern California Coastal Water Research Project staff) was in an intermediate stage of development. We actively participated in the development of CRAM, and were involved with the initial field testing. Data from this project were provided to SCCWRP to assist in the field verification phase, where several sampling groups used the methods at different tidal estuarine, riverine, and depressional wetland sites. We contributed to this verification by employing draft CRAM protocols at our mitigation sites to determine the utility of the methods in the functional assessment of small restored or newly created wetlands typical of regulatory actions. The development of CRAM has tended to focus on the assessment of larger, more complete wetland systems rather than small sections of defined acreage that are either isolated, or in proximity to existing wetlands. While we used CRAM as the foundation of our functional assessments, we modified the existing version to suit the evaluation of mitigation sites and the specific objectives of this project.

Our primary indicator of functional success was the "UCLA-CRAM" score, which was obtained through our modifications of CRAM Version 2.0 (Collins et al. 2004). One important modification was the superimposition of a linear 1-12 scoring scale over the categorical (A, B, C, D) CRAM score; using a linear scoring scale allowed the individual CRAM scores to be combined into a single functional score for the site. This numerical scale was divided evenly across four categories: optimal (12, 11, 10), sub-optimal (9, 8, 7), marginal (6, 5, 4), and poor (3, 2, 1). For the most part, we used the CRAM narratives as written such that the CRAM "A" score was roughly analogous to the UCLA-CRAM "Optimal" score, except that the scorer could choose whether the score should be low, middle or high for that category. The CRAM/UCLA-CRAM relationship is not exact, however. This 1-12 numerical scale was used even for those CRAM metrics with only three (A, B, C) scoring choices. In such cases, we used the same CRAM scoring narratives, but spread the score over a wider and linear scale. Some of the CRAM scoring criteria were also modified for UCLA-CRAM to make them more appropriate for mitigation sites.

In CRAM, the evaluation of buffer habitats does not consider that portion of the buffer within 10 meters of the assessment area, and mowed grass does not constitute buffer. In urban settings typical of many mitigation sites, even narrow buffers and greenbelts can be beneficial, so we started our buffer evaluation at the edge of the assessment area (mitigation site perimeter) and included greenbelts as buffer. The reduced quality of greenbelt buffer was accounted for in the "buffer condition" metric. We also added an additional landscape context metric, "linear contiguity," using the evaluation criteria established in Stein and Ambrose (1998). CRAM does not consider the "upland connection" metric as appropriate for certain wetland classes. For the "lacustrine" and "spring and seep" mitigation sites we evaluated, we determined that the "upland connection" metric was appropriate and included it in our assessments of those sites. Lastly, we encountered several mitigation sites with artificial hydrology that blurred the distinction between "riverine" and "depressional." For "treatment wetlands" associated with housing developments or water reclamation facilities that were largely enclosed basins but with flow-through hydrology, we used the "riverine" evaluation criteria. Detention basins were included under this category as well.

In addition to the above modifications, aspects of several mitigation sites created complications in the employment of CRAM. For the CRAM 'riverine' evaluation, the method was designed to assess the complete riverine system which includes the channel and both banks. However, mitigation sites were often restricted to a single bank and the assessment area may not include the channel. This complication affected all three hydrology metrics (water source, hydroperiod, and upland connection), two of the abiotic structure metrics (abiotic patch richness and topographic complexity), and two of the biotic structure metrics (biotic patch richness, and interspersion and zonation). The convention that we adopted was to consider the channel as part of the assessment area for these metrics, as long as the mitigation site was in direct proximity to, and in hydraulic contiguity with, the channel. Mitigation sites not directly associated with a channel (such as isolated upland sites) received poor scores for those metrics.

As a final departure from the written CRAM protocol, the plant community integrity metric originally required detailed lists of dominant and co-dominant native and non-native plant species at the site. This procedure was designed to facilitate the assessment of the percent of co-dominants that were non-native invasive species, but this was often readily discernable without creating these lists. Therefore, we seldom completed these detailed lists.

CRAM Version 2.0 had no established means of combining individual metric scores into category scores (e.g., landscape context), or into a single overall CRAM score. However, we felt that the utility of the CRAM assessment would be improved for this project if individual CRAM score were aggregated into summary scores. In aggregating scores, we did not apply different weights to different CRAM categories, but considered them to be equally important. Thus, an arithmetic average of the four category scores was calculated to achieve an overall CRAM functional evaluation score. Arithmetic averages were also calculated to yield three of the category scores (hydrology, abiotic structure, and biotic structure). The landscape context category was treated differently because the extent of assessment area with buffer and buffer width were designed to factor in the size of the buffer with respect to its condition; therefore, we approached the relationship between these three metrics as multiplicative, rather than additive. To illustrate this, it is possible to have a very high quality buffer that is adjacent to just a small portion of a site. Conversely, most of a site may have extensive buffer areas that are of very low quality. Thus, we multiplied these first three metric scores together, and then calculated the arithmetic average between this resulting score and the remaining landscape context metric, linear contiguity.

As in Phase I, it was often impossible to make a single functional evaluation for each permit file because many files involved multiple discrete mitigation projects that needed to be considered independently. (For example, using CRAM, it was either impossible or not appropriate to "average" together the functional assessment of a wetland creation project and a riparian enhancement project that were part of the same permit file). Full functional assessments including CRAM, UCLA-CRAM and all other supplemental evaluations (see below) were performed for all 79 discrete mitigation projects.

4.8.2. Supplemental Evaluations

In addition to CRAM, we planned to perform limited collection of supplemental data, although the methods that would be useful or necessary were not specified in the contract. After initial visits to some mitigation sites, we recognized that the wide variety of habitats and ecological contexts we would need to evaluate meant it would not be feasible to develop a single set of quantitative evaluations that could be performed at all of our sites. For example, benthic macroinvertebrate samples could not be collected at all the sites (a possibility suggested in the contract) because no surface water was present at the vast majority of mitigation sites. Therefore, we decided to develop a set of supplemental qualitative assessments that would address as many as possible of the mitigation-related issues not addressed in CRAM. To do this, we reviewed the literature on qualitative assessment methods (see Appendix 1: Review of existing wetland assessment methods) and compiled an extensive list of topics relevant to the assessment of mitigation projects; these were further refined following trials at several early site visits until a final list of evaluation metrics was made. Consistent with UCLA-CRAM, most metrics were evaluated on a 1 to 12 scale distributed uniformly across four categories: Optimal, Sub-Optimal, Marginal, and Poor.

The topics we evaluated included the success and appropriateness of the mitigation work, plant/habitat community characteristics, wetland conditions and jurisdictional habitat, and beneficial wetland/riparian services gained compared to what was likely lost at the impact site. These evaluations are discussed in the following sections.

Supplemental Qualitative Assessments

CRAM is a comprehensive evaluation protocol that was developed to assess the overall condition of wetland sites. As with all such methodologies, there are limitations to what CRAM evaluates. Through the supplemental qualitative assessment, we hoped to address some of these limitations. This supplemental assessment consists of a collection of individual assessments that are treated independently of each other; these cannot be summed or averaged to yield a supplemental function score. Included in this collection are estimates of plant density and diversity, total native cover and total cover of invasive species, and the percent cover of *Arundo donax*, a particularly troublesome invasive plant in the Los Angeles region. We also focus on one relevant stressor, the influence of impervious substrate on the sites. Additional assessments were made that focus on the success of the mitigation project with respect to its potential longevity, its ability to persist without artificial watering, and the overall quality of the habitat. The final three assessments consider how successful the mitigation activities were in replacing lost functions, how successful the permittees were in satisfying their permit obligations, and how appropriate those permit obligations were in guaranteeing that the goal of "no net loss" of remaining wetland habitat and function would be met, as approved. All these supplemental qualitative assessments were scored using the same linear 1-12 scale as in the UCLA-CRAM evaluation. The evaluation criteria that we developed for these assessments are given in Appendix 2: Supplemental Qualitative Assessment Methods. We collected data on the presence of wildlife at each mitigation site as part of the Supplemental Qualitative Assessment, but we do not include those data here because we decided that they did not add significantly to the findings of the report.

Jurisdictional Habitat Assessment

Another component of our supplemental evaluations was the visual estimation of jurisdictional and non-jurisdictional habitat types present at each mitigation site. While wetland delineations at proposed impact sites are a required step in the permit process, there is no requirement that similar wetland delineations be performed at mitigation sites to ensure that adequate acreage of jurisdictional habitat is created, restored, or enhanced. Performing full legal wetland delineations at mitigations sites was beyond the scope of this contract. However, at each mitigation site we made a qualitative assessment of the approximate proportions of jurisdictional and non-jurisdictional habitat types that would have been recorded had such wetland delineations been made. In this assessment, the first distinction we made was between that portion of the site that was within the ordinary high water mark of the water body, including adjacent wetlands (federal waters), and the remaining portion of the site. The "non-waters" area was apportioned into riparian habitats and upland habitats. The "waters of the US" area was apportioned into wetland habitats and non-wetland waters. Our wetland estimates did not conform exactly to the three parameter test (hydrology, hydric soils, and hydrophytic vegetation) because for younger sites, we factored in the potential for future development of soils and plants provided that the hydrology was appropriate. Therefore, our data likely represent a slight to moderate overestimate of jurisdictional wetland habitat, since some of these sites might not develop hydric soils. In both 401 and 404 permits, non-wetland waters are often, but inconsistently, broken down into more specific categorizations such as "streambed," "open water streambed," "unvegetated streambed" and "vegetated streambed" habitats, but are often simply referred to by some other description such as "riparian waters." We followed this same approach in subdividing the non-wetland waters category, but in a way that would enable back-combining in an unambiguous way. Non-wetland waters categorized as "other" were almost exclusively those riparian waters habitats that were within the ordinary high water mark of the water body, but beyond the channel or adjacent wetlands. The most clear definition of "riparian" specifies those areas which are "…adjacent to perennial, intermittent, and ephemeral streams, lakes, and estuarine-marine shorelines" (NRC 2002). But in regular use, and in the permit files, there is substantial ambiguity in the application of "riparian," with reported impacts to riparian waters that may or may not include the channel itself. This ambiguity makes it difficult for us to compare our riparian waters category to those from the permit files.

Wetland Indicator Assessment

To ascertain whether the mitigation sites could be considered wetlands, and to get a sense of the proportion of those sites that had wetland characteristics, we performed a three parameter wetland indicator assessment by evaluating sites for wetland hydrology, hydric soils, hydrophytic vegetation. These wetland indicator assessments were scored using the same linear 1-12 scale as in the UCLA-CRAM evaluation. For a full description of the evaluation criteria developed for these assessments, see Appendix 2: Supplemental Qualitative Assessment Methods.

Services Lost vs. Gained Assessment

There is substantial variation among both impact sites and mitigation sites in landscape position, wetness regime, habitat quality, and the functions and services that result from these and other aspects of the sites. Certain impact project types result in relatively low functional loss while some mitigation activities added very little net gain in function. Impact habitat types often do not correspond to their required mitigation habitat types, and the justification for this is that the functions and services that were lost at the impact site are being adequately replaced by mathematically equivalent functions or services gained at through the mitigation measures. We chose to investigate whether this is being accomplished through direct qualitative assessments of the services gained through mitigation activities, compared to what was lost through project impacts.

The beneficial services we considered were flood water storage, flood energy dissipation, biogeochemistry (e.g., water purification, nutrient cycling), sediment accumulation, wildlife habitat and aquatic habitat. We planned to include groundwater recharge but this was not relevant at most of our riverine sites. For each of these services, we considered what was actually accomplished at a mitigation site (the functional difference between the pre-mitigation state and post-mitigation state of the site) compared to the loss of services that occurred at the impact site. This was, of course, not a simple assessment since we had no direct experience with the pre-project states of either the impact site or the mitigation site. However, for all these projects, there was at least some information available that could be used to infer the condition of these sites prior to project activities. Sources of this information came directly from the permit files in the form of project and mitigation site descriptions, photographs of the sites before and after work began, information included in the general permit paperwork, correspondence, mitigation plans, and mitigation reports. We were almost always able to view the impact project during our field visits and in doing so, we considered the general landscape position of the site as well as the condition of nearby, undeveloped sites of the same landscape position. Aerial photographs taken of the sites were also useful in this regard. Occasionally, we gleaned information about the pre-project states of the impact and mitigation sites through discussions with individuals knowledgeable about the project.

As an example, if the impact project consisted of adding a lane to a bridge crossing, the actual permanent losses might consist of a small amount of area consumed by the increased footings, the shading the results from the addition of one lane width, and perhaps some additional riprap armoring. These impacts would represent minimal change to the flood storage or flood energy dissipation capabilities of the site. Only small reductions in the biogeochemistry and sediment accumulation potential would occur. Aquatic habitat would be low if the site was a floodplain wash, and the wildlife habitat would have been low if the site was devoid of vegetation and in a heavily urbanized area. On the other hand, re-vegetation mitigation to occur in the floodplain downstream of the bridge, which might be destroyed during subsequent floods leaving the channel again devoid of vegetation, would have represented zero gains in any of the above services.

We did not develop narratives specifying the precise evaluation criteria used in this "services lost versus gained" assessment. These were simply structured "best professional judgment" decisions that we made following the approach illustrated in the above example. Structure was added to the judgment decisions by separating our loss/gain determinations into the individual services, similar to how CRAM deals with individual metrics. As we made these determinations, we considered multiple site attributes such as general landscape position including catchment size, proximity to headwaters, adjacent and upstream land uses, general channel geomorphology including gradient, sinuosity, substrate type, bank characteristics, presence of water, depth, flow patterns including water velocity and riffle/pool sequences, and general habitat characteristics including wetland conditions, the structure and diversity of wetland vegetation, presence and extent of hydric soils, the structure and diversity of riparian plant species, the width of the riparian buffer, and others. Only permanent losses were considered in this evaluation, and as in the above example, we tried to think very specifically about what the realized losses (and gains) were. A series of case studies, which is presented in the guidance document associated with this project, illustrate the way we approached this evaluation. As these are best professional judgment decisions, they should be interpreted as providing only a general picture of loss/gain.

These qualitative estimates of loss versus gain were recorded along the same linear 1-12 scale as used in other parts of the functional evaluation. Once recorded, we subtracted the loss score from the gain score for every service assessment, and then displayed the results along a number line which is centered around zero (complete replacement) such that negative numbers represent net losses, and positive numbers represent net gains. We refer to the scale intervals as "service units."

Wetland Evaluation Assessment

In addition to UCLA-CRAM, we employed the Wetland Evaluation Assessment (Breaux and Martindale 2003), or WEA, which is a functional evaluation method created as a joint venture between the San Francisco Regional Board and the San Francisco Army Corps of Engineers as an adaptation of the Florida Wetland Rapid Assessment Procedure (Miller and Gunsalus 1997). This method was created specifically for the evaluation of compensatory mitigation projects and the complete methodology can be considered an alternative to our combined Phase I and Phase II evaluations. Much of WEA was time consuming, requiring the creation of comprehensive species lists by expert plant, invertebrate, and bird experts, and since these aspects of the method were outside the scope of our study, we did not include them in our site evaluations. In addition, the "overall compliance" score would have been redundant given other parts of our study, so it also was not included. We simply used the main qualitative evaluation protocol that assesses site function through five assessment categories on a summed 0-15 scale. These five categories are: surrounding land use, adjacent buffer, indicators of hydrology, averaged vegetation score, and wildlife utilization. This method is heavily focused on vegetation, and evaluates the vegetation community within three structural layers: herbaceous, shrub, and tree. We included an overall "all vegetation combined" evaluation for comparison but dropped this from our analyses. The results from this auxiliary evaluation are not included in the body of this report, but are included for reference in Appendix 8: Wetland Evaluation Assessment (WEA).

4.9. Digital Photographs

Digital photographs were taken at all of the mitigation sites. Our objective in taking these photos was to capture the "essence of the site" at the time of our site visit. In many cases, only a few photos were necessary to accomplish this, while at other sites, many photos were needed. It was difficult to cover some sites adequately because of the sheer size or complexity of the site. The digital images were organized within computer folders labeled with the appropriate file number. We have provided two sets of digital pictures. The first set consists of all the photographs taken at each site. The second set consists of a single reference photograph for each mitigation site evaluated (see Appendix 4: Digital photos with reference locations). In addition, aerial photographs of many of the sites were taken during recreational flights in the Los Angeles by Steven Lee, who is a licensed private pilot[5]. These images afford a more complete view of the mitigation sites from a vastly different perspective than our land-based shots, often capturing multiple mitigation sites and the surrounding land use in one photograph. Several aerial images were taken per file number at a high quality setting to allow for maximum resolution. All digital images are provided on Compact Disc (CD) media.

4.10. Data Analysis

As stated earlier, a number of permit files consisted of two or more discrete mitigation sites that could not appropriately be combined into a single evaluation. Thus, separate Phase I and Phase II evaluations were made for each of these sites to yield a total sample of 79 individual mitigation site evaluations for the 50 permit files included in our study. However, because it was desirable to obtain single compliance or success scores for each of the 50 permit files, we sought an objective means of "averaging" the scores from separate mitigation sites that were part of the same permit. The most reasonable and defensible approach that we could arrive at, and the one we employed, was to consider an individual mitigation site's score in relation to the proportion of total permit file area that that mitigation site's area represented. More specifically, we calculated this single score by multiplying the individual compliance and function scores by the proportion of the total mitigation acreage that each mitigation site comprised, then summing the proportional scores to achieve single scores of success by permit file. While this convention represents an objective means of determining single scores, it needs to be understood that some of these calculations were less than straightforward due to complexities in our acreage evaluation. While most files had adequate information available to determine these acreage proportions (either from our GPS data or from the permit and/or mitigation plan documents), there were a few files with undeterminable boundaries and poor documentation where we had to estimate the approximate acreage proportions that each mitigation site represented. A full accounting of these decisions is

[5] These images are not part of the deliverables of this project and are being donated without compensation.

provided in Appendix 6: GPS Information. The resulting compliance and functional success scores, by file, were added to the Access database.

For our determinations of permit compliance and functional success, we sought to mimic the criteria used by Sudol (1996). In that study for permit compliance, success was meeting 100% of the permit conditions, failure was meeting 0%, and partial success was anything in between. For function, success was achieving a functional success score greater than 80% (based on the lowest functional capacity score Sudol found at his reference sites), failure was below 50%, and partial success was a score between 50% and 80%. For permit compliance, we adopted Sudol's convention exactly, but for functional success we used the breaks between the lowest optimal score and the highest sub-optimal score for success (79.2% on the linear 1-12 scale) and between the lowest sub-optimal score and the highest marginal score for failure (54.2% on the linear 1-12 scale), as these were roughly equivalent to the 80% and 50% breaks respectively from Sudol (1996). In addition, we considered success in satisfying the acreage requirement to be meeting or exceeding the acreage required in the 401 permit, and failure to be anything below that amount. Instead of using the terms success, partial success, and failure for our CRAM determinations, we used the terms "optimal condition," sub-optimal condition, and "marginal to poor condition" respectively, since CRAM scores were not specified in the permits and they have not been calibrated against reference natural wetlands. In a later analysis, to facilitate a rapid survey of the mitigation success results, we asked the following compliance- and success-related questions for each of the permit files and individual mitigation sites: Was the acreage requirement met? Was compliance with 401 conditions met? Was compliance with mitigation plan conditions met? And, was function optimal? For permit compliance, the answers to the compliance questionnaire were classified as: yes (100%), mostly (75-99%), partially (26-74%), barely (1-25%), and no (0%). For functional success (with additional categories within 5 percentage points of the numerical cutoffs) the answers to the compliance questionnaire were: yes ($\geq$79.2%), mostly (74.2-79.2%), partially (59.2-79.2%), barely (54.2-59.2%), no, but nearly (49.2-54.2%), and no (<49.2%). For some sites, these questions were either not relevant (N/A) or could not be assessed (ND).

There is a substantial amount of overlap among the various habitat types identified in 401 permits, both at impact sites and at mitigation sites. Examples are the relative similarity between estuary, tidal wetland, and tidal salt marsh, and between coastal scrub, coastal sage scrub, and chaparral. For our analyses, we consolidated these into a more tractable list of habitat types for our analyses. The approach we used is displayed in Appendix 3: Condensed habitat-type categories.

4.11. Quality Assurance/Quality Control

Due to the complexities of this project, quality assurance and quality control (QA/QC) measures warranted increased attention. Initially all permit review information was entered into our newly created Access database. This initial data entry was performed by two people with one person reading data values and the other person double-checking the information after it was entered. The permit paperwork contained many obvious grammatical and spelling errors, which were edited in the database. Once entered, many of the field data sheets were printed directly from this Access database, which reduced the chance that erroneous information would be transferred to our evaluation forms. After data were collected in the field on paper datasheets, information was transferred into Access. Data were entered directly from the paper datasheets to electronic versions of the datasheets from which they were derived. In order to reduce human error during data entry, this Access database was designed to only allow data entry in the appropriate format specific to that datasheet. For example, the electronic CRAM data form only allows the entry of letter grades A, B, C, D and the option of N.A. when entering data into this form. Once all data were transferred from paper field datasheets into the Access database, certain measures were initially undertaken to ensure that no files were inadvertently missed or entered repeatedly. All data entered for each of these forms were reviewed to ensure that each file and mitigation site was present and entered into the database. Then, each Access table was visually reviewed to check for inaccuracies such as blanks (e.g., skipped entries), improper values (e.g., numerical data that was out of the allowed range), and duplicate entries.

After all data were entered, the entire set of data in the Access database was double checked against the paper data sheets to make sure that no errors occurred. In advance of this complete check, 7 files comprising about 10% of the 79 mitigation sites were randomly selected from the database and reviewed for completeness and accuracy in data entry. Tallies were recorded for each data error found and the total set of errors was reviewed for patterns. Since some of these errors were substantive, and since all forms appeared to be equally prone to data errors, we decided to double check every datum from every field data form. To begin, all paper datasheets were examined for completeness and all mental calculations present were checked with calculators to ensure accurate computation. Every paper data sheet from every component of the study was double checked against the Access database, slowly and methodically, by a person other than the original data enterer. Any inconsistencies, of which several were identified, were corrected. We are confident that the resulting Access database is free from data management errors.

The GPS data were treated separately from the remainder of the field data and were not included in the Access database. The QA/QC measures taken with respect to the GPS data include ensuring adequate satellite geometry and maintaining a PDOP value around 2.00, differentially correcting the data using the nearest base station provider, and double checking the information after differential correction for erroneous results. Most of these steps were taken for reasons of protocol. It should be noted that the ambiguities we faced in our boundary determinations would render most measurement inaccuracies insignificant. The remainder of post-processing steps involved adjustments to site boundaries using ArcMap. These adjustments, along with the decisions involved in the proportional acreage estimates mentioned above, were made in the most reasonable, unbiased, and transparent way possible, and records were maintained so that all such decisions can be traced within our computer files.

Data from the Access database were extracted through numerous queries and were further processed using Microsoft Excel, SigmaPlot, and Systat, and were ultimately presented in Microsoft Word as a series of tables, figures, and associated text. Due to the complexity of the data set and the nature of this study, which was innovative rather than boiler-plate, the opportunities for mistakes to occur through data management were numerous. Because of the truncated time frame of this contract, deliverables were often due before all aspects of the information given in these deliverables could be checked. Minor data management mistakes, misinterpretations, and formatting issues identified in the earlier deliverables have been resolved for this final report.

5. Results and Discussion

In this section we give the basic results from the four principle components of the study (permit review, permit compliance evaluation, acreage evaluation, and functional evaluation) and the supplemental functional evaluation, along with a discussion of those results, as appropriate. In the next section, we combine elements from all five sections to provide an overall summary of the study's results.

5.1. Permit Review

Ninety of the LARWQCB storage boxes were inventoried. Within these 90 boxes, 887 permit applications were found from 1991 to the present, for which 601 permit certifications were issued (Table 1). Comparing these numbers to the corresponding numbers from the agency databases indicates that our survey included about 70% of the possible permit files. However, we surveyed less than 45% of the storage boxes, since there were over 200 boxes present. In addition, the number of certifications we found exceeded the database records for total certifications issued for those years by about 150 permits. This is likely due to the fact that we considered the issuance of "no further action" statements as *de facto* certifications. Of the 601 certifications issued, 319 required some form of mitigation. This number also exceeded the total number of mitigation-requiring permits for those years recorded in the LARWQCB database, with an almost equally large discrepancy between the LARWQCB and SWRCB databases. This discrepancy is most likely because the definition of a mitigation requirement is not consistent among agencies, and because we took the most inclusive approach possible. From our file review, we found that about 68% of the permits issued during this time span were certified, and about 53% of those files required some form of mitigation.

The numbers of permit applications, certifications, and certifications requiring mitigation are given by year in Table 2. This table shows that no permits requiring mitigation were found for 1990, and only seven were found for 2003. The low number of permits found in 2003 is explained by the fact that many of these files were still active at the time of our study and thus were not placed in the archives. For this reason, permits issued in 2003 were not included in this study. For most years from 1991 to 2002, the number of files we reviewed exceeded our target sample of 20 files per year. The exceptions are 1991 and 1992; we were not able to find any more files for those years despite an attempt to locate files for these years in the remaining file boxes.

All files from those1991 and 1992, plus the first 20 files reviewed for each of the remaining years, were planned for inclusion in the population of files from which we would randomly select our set of 50 files for compliance and functional evaluations.

However, since we had already reviewed more than 20 files from some years (due to our pre-stratification file reviews), the size of our sample was increased by 33 files, for a total of 250 files. All relevant documents from these 250 files were photocopied for further review and data extraction. Once our random sample of 50 fully assessed permit files (plus 5 additional files that could only be assessed for compliance) was determined, we were able to compare the permit review information from these assessed files to the total population of 250 files (termed “all files”). The number of permits issued per year seems to be slightly cyclical, with peaks present every two to three years (Figure 2). Three years (1995, 1998, 2001, and 2002) stand out as having relatively high numbers of permits issued. Our random sample of permit files was well distributed throughout the 12 years included in the survey, and largely proportional with respect to the population of 250 files. Disproportionately few files were included from the last three years, 2000, 2001, and 2002. This was not due to problems with our random selection process, but because files selected from these years were frequently rejected from our study upon field reconnaissance, largely because the impact projects had not yet been completed (Table 5).

The number of files by certification type is given in Figure 3. Conditional certifications were by far the most common type of certification issued, making up ~55% of all certifications. Non-specified certifications and standard certifications together made up nearly 20% of permits issued, while “no further action” (NFA) statements and waivers combined made up about 25%. These “NFA” statements were commonly issued prior to 1998 as the LARWQCB deferred to the requirements already specified by the other regulatory agencies. Because the regulatory outcome of these NFA statements is not fundamentally different than a certification containing a few additional conditions (with respect to the overall Section 404 process), we considered these NFA statements as *de facto* certifications. Our sample of 55 assessed files was roughly proportional to the total population of 250 files, but with proportionately fewer conditional certifications and no waivers.

The number of files by impact project type is given in Figure 4. Residential/urban development projects were the dominant project type permitted (35%), followed by flood control, bridge crossing, and bank/channel work projects (18%, 16%, and 16%, respectively). Pipeline/utility project were about half again as common (7%), and the remainder of the project types were represented by just a few files each. Our sample of 55 assessed files was roughly proportional to the total population of 250 files.

The number of files by impact type is given in Figure 5. Permanent impacts were more than twice as common as temporary impacts (66% compared to 33%) and our sample of assessed files was proportional to the total population of files.

The number of files by mitigation type is given in Figure 6. Restoration projects were the most common (46%), followed by creation (27%), enhancement (20%), and preservation (8%). Creation and restoration projects combined made up 73% of files, while enhancements and preservations combined made up 28%. Our sample of assessed files was proportional to the total population of files.

The number of files by habitat type impacted is given in Figure 7. The categories used here were taken directly from the permit files, ordered so that wetter habitats are at the top of the figure and drier habitats are at the bottom. Vegetated streambed was the most common habitat type impacted (30%), followed by non-distinguished wetland (24%), riparian (18%), unvegetated streambed (13%), and unspecified waters (9%). The remaining habitat types had only one or a few permitted impacts each. Our sample of assessed files followed this same general pattern, but with proportionally fewer impacts to vegetated streambed habitat (23%), and impacts to only two of the habitat types with few permits (estuary and marsh wetland).

A similar summary showing the number of files by mitigation habitat type is given in Figure 8. The number of habitat type categories was greater for mitigation projects as compared to impact projects. The five habitat types that were impacted most were among the most common habitat types comprising mitigation projects, but two additional categories (open space and in-lieu fees) were common as well. Riparian habitats were the most common mitigation habitat type (31%), followed by vegetated streambed (19%), non-distinguished wetland (14%), and in-lieu fees (9%). Unspecified water (6%), unvegetated streambed (5%), and open space (5%) were somewhat lower. A comparison of these last two figures suggests some inconsistencies between the habitat types lost and the habitat types gained through mitigation, with losses to wetlands and streambed habitats offset by gains to riparian and open space habitats, plus gains to in-lieu fee-funded mitigation projects.

A summary of the acreage impacted in our sample of 55 permits is presented as a matrix between impact type and habitat type in Table 3. Permanent impacts comprised 60% of the acreage impacted while temporary impacts comprised 40%. The majority (72%) of the temporary impacts occurred in unspecified waters. The majority of the permanent impacts (56%) occurred in non-distinguished wetlands while vegetated streambed comprised the second-largest portion (15%) of the acreage impacted permanently. Overall, seventy-three percent of the impacts occurred in both non-distinguished wetlands (36%) and unspecified waters (37%). The habitat types with the next largest overall acreage impacted were vegetated streambed (12%) and riparian habitat (12%). Estuary, unvegetated streambed, and marsh wetland habitats combined comprised less than three percent of the total acreage impacted. The average acreage permanently impacted across this sample of 55 permit files was approximately 1.9 acres per file.

5.2. Permit Compliance Review

An overview of the number of files and mitigation sites that were included in our compliance evaluation is presented in Table 4. A total of fifty-five files were selected for compliance analysis. This exceeded our original target of 50 files because the mitigation for five files consisted of in-lieu fees that could not be tracked to individual mitigation sites, and we wanted to have 50 files for the full functional (Phase II) evaluation (as explained below). The five additional files could be evaluated for permit compliance (fees paid or not) only. These 55 files represented 84 mitigation sites because 20 of these projects had multiple mitigation sites. Of these 55 files, six permit files (and the 14 mitigation sites associated with them) lacked permit conditions that could be assessed in our office or field surveys, leaving 49 files for 401 permit compliance assessment. Fifty files (and their associated seventy-nine mitigation sites), however, could be evaluated for 401 permit compliance with modern conditions. Only 40 files had mitigation plans. Of these, two files lacked permit conditions that could be assessed, leaving 38 files (representing 63 mitigation sites) for which mitigation plan compliance could be assessed.

A total of 76 permit files were randomly selected from the total population of 250 permit files to be included in our comprehensive file review. For each of these files, an office assessment was performed wherein all photocopied documents from the permit file were evaluated to understand both the impact project and the expected mitigation measures. Data forms were printed out from our Access database that contained all the permit information necessary to perform our compliance evaluation (such as the standard and special conditions that were mandated). With our entire permit file and data forms in hand, a field visit was made to the expected mitigation project location (and usually the impact project location as well), to locate the mitigation site or sites, and to determine if compliance (Phase I) and functional (Phase II) evaluations could be made. Upon visiting the project locations for 21 of these 76 permit files, we determined that compliance evaluations would not be appropriate or possible for a variety of reasons. Examples of such reasons are: the impact project never occurred, the mitigation project was still under construction, or no evidence of mitigation activities could be found. A full list of these 21 rejected permit files is given in Table 5, including the reason that forced us to exclude these files from our list of 50 Phase I evaluations. As each of these files was rejected, a new randomly determined file was chosen to replace it. For five permit files (mentioned above), the mitigation requirements consisted solely of in-lieu fee payments which were made, but could not be tracked to specific mitigation projects. These files, which could be assessed for compliance (the fees were paid) but not function, are listed in Table 6. The remaining 50 files for which full compliance and functional evaluations were made are listed in Table 7.

The full set of compliance results for all 79 individual mitigation sites within the 55 assessed permit files is presented in Table 8. These data are organized into the three evaluation categories: 401 permit compliance, 401 permit compliance with modern conditions, and mitigation plan compliance. Within each of these assessment categories, we list the number of standard and special conditions that could be assessed, the number of those conditions that were met, and the percent compliance score. As indicated earlier, there were often other stated conditions that could not be assessed in either the office or field surveys (Table 9). Tables listing all permit conditions found through our permit review, including a list of the most common conditions, are given in Appendix 7: 401 Permit Conditions. Those permit files for which none of the stated conditions could be assessed are indicated by a zero in the 401 permit compliance category. Dashes indicate those files for which no evaluation was possible because no mitigation plan was available.

The following series of figures display the above results by overall compliance score, certification year, certification type, and project type. A histogram showing the distribution of mitigation sites by their 401 permit compliance score is given in Figure 9. Sixty-nine percent of the sites (48 of 79 sites) complied with 100% of the (assessable) conditions; 31% did not comply with all of the permit requirements. Only one site did not comply with any of the requirements. In this analysis, the number of assessable permit conditions was not standard and ranged from one to eight. For a site that had only two assessable permit conditions, a failure to meet one of the conditions would result in a compliance score of 50%. A similar histogram showing a comparable distribution of 401 compliance scores, but including the eight modern 401 permit conditions, is given in Figure 10 (note the different scale than Figure 9). A much lower percentage of sites achieved 100% compliance compared to the stated 401 permit conditions. This is to be expected since the permittee of a past project was not required to comply with the conditions typically included in more recently issued permits. However, 70% of the sites had compliance of 70% or higher, which is similar to the results for the stated permit conditions. Thus the majority of mitigation projects would have been in or near compliance with the set of modern permit conditions, had they been required. The distribution of scores from the corresponding mitigation plan compliance evaluation is given in Figure 11. Sixty-seven percent of the sites (42 sites) achieved a compliance score of 100%; 33% of the sites failed to meet the requirement of full compliance. Three sites failed completely. These results are similar to those for the stated 401 permit conditions (Figure 9) and taken together, these findings suggests that overall, about 1/3 of sites are not meeting their permit conditions (at least amongst those conditions we were able to assess).

Average 401 permit compliance by certification year is shown in Figure 12. Average compliance was 60% or greater in all years. While the pattern of compliance does not seem to follow a clear trajectory through the entire study, it seems that compliance has been generally improving since the mid 1990's. Our sample size of early 1990's permits may have been too small to reflect accurately the compliance success of projects in those years. A similar analysis for compliance with the set of modern permit conditions is shown in Figure 13. The pattern through the years shows greater variation than for the stated conditions with no clear trend. Projects from the last three years (2000, 2001, and 2002) appear to have higher compliance, which is expected for this set of modern conditions. Average mitigation plan compliance by certification year is given in Figure 14. There were no files certified in the year 2000 from which we could obtain mitigation plans in our sample. The year in which mitigation plan compliance was lowest was 1996 at 33%. These results are not as robust as those for 401 compliance because of the reduced number of permit files that contained mitigation plans, and hence, the smaller sample size. However, it appears that compliance with meeting the conditions outlined in mitigation plans (a proxy for assessing all agency conditions) has not consistently improved in recent years.

Average 401 permit compliance by type of certification is given in Figure 15. Projects with letters of certification (standard and conditional) had a slightly lower compliance percentage than those for which "no further action" (NFA) letters were produced, though this difference was not significant. The regulatory difference between NFA projects and the more recently produced certification letters may have been largely due to management actions and performance standards that were not possible to assess in either our office or field surveys. A similar analysis for compliance with the set of modern permit conditions is given in Figure 16. The pattern of compliance success is reversed compared to that for the stated 401 conditions (Figure 15), however the difference between NFA and certification permits was, again, not significant. Average mitigation plan compliance results by certification type are given in Figure 17. Similar to the results for the modern 401 conditions, files where NFA letters were issued had slightly lower compliance success than for permits with certification letters. Again, this difference was not significant. This graph is presented for completeness; there is no obvious reason to expect that these two categories of permits would have differences in meeting the conditions of their respective mitigation plans.

The average permit compliance by the type of impact project is given in Figure 18. Projects that involved flood control/drainage, bridge crossings, and bank/channel work had lower compliance success in their associated mitigation projects compared to the majority of project types. The category "other" had the lowest compliance success. This category includes parking lots, bike trails, marine terminal, marine levees, clean-up and restoration projects, among others. Section 401 compliance was significantly different among impact project types (Kruskal-Wallis one-way ANOVA, KW=14.620, p=0.041 assuming chi-square distribution with 7 df). A similar analysis for compliance with the set of modern permit conditions is shown in Figure 19. As with the stated 401 conditions, projects that involved flood control/drainage, bridge crossings, bank/channel work, and the "other" category showed reduced compliance success compared to other project types. The average mitigation plan compliance by type of impact project is given in Figure 20. The "other" category had dramatically lower mitigation compliance success compared to the rest of the project categories, although bridge crossings and bank/channel work were slightly lower as well. The average permit and mitigation plan compliance results for all sites that had conditions specified in both their respective permits and mitigation plans is given in Figure 21. There was little difference between distributions of the permit and mitigation plan compliance data.

A summary of the compliance for individual conditions specified in 401 permits is presented in Table 10. This table gives the percentage of mitigation sites that complied with a particular condition, as well as the percentage of sites for which an assessment of the compliance with that condition could not be made. The surveyed mitigation projects generally did well on revegetation conditions, with 100% of mitigation sites meeting the "presence of species specified for revegetation" condition, and 94% meeting the "native vegetation present?" condition. These high rates of success can be attributed in part to the simple yes versus no (presence/absence) nature of the compliance evaluation for these conditions. Even if only a single plant was present that was native or on the planting palette, this condition would be satisfied. This applied to another condition as well ("evidence of restorative planting"), for which a reasonably high number of sites (73%) were considered compliant. Conversely, a low percentage of sites were in compliance with respect to the "exotic plants absent" condition. Even if only a single exotic plant was present, this condition would not be satisfied. We specified another condition to address the requirement of exotic removal, "evidence of exotic plant removal," so that we could record whether or not an attempt had been made to remove exotics. As expected, compliance with the latter condition is higher because it does not require the absolute absence of exotics to be met. But for older sites, it was often not possible to determine if exotic species had been removed whether or not those plants were present at the time or our site visit. The removal of exotic plant species is a very difficult task and it is unrealistic to expect that absolutely no exotic plants will be present in the years following mitigation activities, especially given the landscape position of most mitigation sites (i.e., adjacent to or “downstream” of sites with exotics). What is really important here is whether exotics that may be present are exerting an ecologically significant impact on the site. Therefore, we assessed whether there was a minor impact of exotics on site. Roughly 80% of the mitigation sites met this new auxiliary condition, which is a substantially different result than that obtained from the previous conditions. Still, this means that exotic plants were ecologically significant at about 20% of the sites. Seventy-two percent of the sites had either clear evidence of ongoing maintenance activities, or showed no sign that their post mitigation condition had degraded. For 12% of the sites, we were not able to determine one way or the other if the site was being maintained in perpetuity. A clear lack of compliance with this condition was found for 16% of the sites. Eighty-eight percent of the sites showed clear evidence that grading to pre-project contours had occurred while at 12% of the sites there was no way to tell if this condition was met.

Of all the conditions assessed in Table 10, only two were never found to be out of compliance: grading to pre-project contours, and the presence of specified plant species. Both of these conditions relate to the initial establishment of the mitigation sites, suggesting that the contractors constructing the mitigation are reasonably diligent. However, conditions relating to longer term maintenance and performance of the mitigation sites, such as maintenance in perpetuity and lack of exotic species, had much higher rates of non-compliance.

To summarize the permit compliance results presented above, about 1/3 of mitigation sites failed to meet all of the conditions required in their permits. Compliance was less common in “bridge crossing,” “bank/channel work,” and “other” project type categories. Success was relatively high for vegetative planting requirements, but lower in the requirement that the sites be free from exotics. However, compliance seems to have been improving in recent years (since the late 1990’s), and if one takes an ecological approach to the presence of exotic species, the successful functioning of most mitigation sites is not impeded by exotic plants.

The results for the analysis of compliance with the full set of modern conditions are given in Table 11, and for compliance with all conditions specified in the mitigation plans in Table 12. The general patterns for compliance with “modern conditions” are essentially the same as the above results for the stated 401 conditions. The mean percentage of sites that met their stated conditions (Table 10) was 70.3, while the mean for the modern conditions (Table 11) was 70.6. This suggests that the condition of older mitigation sites would not have been very different had all of these requirements been included in the older permits. For compliance with the conditions set forth in the mitigation plan (a proxy for all agency requirements in the greater Section 404 process), there tended to be relatively high compliance when the permit condition was assessable. Overall, 50.9% of sites met their conditions, but when those conditions for which greater than 50% of the sites could not be determined were removed from the calculation, the mean percentage increased to 71.3%. Had all permit conditions been assessable, this number would have likely gone up rather than down. These results support our perception that the permittees (or their consulting companies) generally did what was required by the permit and/or mitigation plan.

This compliance review could not assess compliance with all permit conditions required in the 401 permits; many conditions simply could not be assessed due to the age of the site and/or the nature of the condition. The conditions we were able to assess were heavily influenced by the yes/no or presence/absence nature of the stated requirements, rather than the ecological "intent" of the conditions. And these assessable conditions were largely related to management actions rather than performance standards. Had mitigation reports been available for all of these permit files, we might have been able to assess a larger proportion of permit conditions. It is possible that many of these missing reports were produced and submitted by permittees but were never added to agency's file archives. Still, it is unclear whether the failure to meet these assessed conditions would necessarily result in a failure to meet the appropriate performance standards, or even if successfully meeting all permit conditions would guarantee the appropriate mitigation site function and an adequate replacement of the functions, values, and services lost at impact sites. These latter issues will be addressed shortly through our Phase II results, given in Section 5.4. However, the other issue related to compliance is success in meeting the acreage requirements of the permit. This information is addressed in the next section.

5.3. Acreage Requirements

The summary of our acreage determinations by permit file is given in Table 13. This table provides information regarding the acreage lost at the impact sites, the acreage required to be gained through compensatory mitigation (both from the permit files), and the acreage that was actually obtained in our GPS surveys. In addition, we provide simple summary statistics of acreage lost versus gained with respect to each of these data categories, and a series of "totals" calculations. In this table, negative numbers in the lost/gain columns identify those sites with acreage shortfalls. As can be seen in the acreage measured column, the boundaries of a significant number of mitigation sites could not be determined. We were unable to obtain acreage estimates for 30% (15) of our 50 permit files.

The total area lost through these 50 permits was approximately 170 acres. This represents the acreage of "waters of the United States," including wetlands and non-wetland waters that were within the limits of federal jurisdiction as identified in Section 404 permits and, correspondingly, in Section 401 permits. The total acreage required to offset these losses was approximately 233 acres, which would have represented a net gain of about 63 acres of wetland and other waters habitat (a gain/loss mitigation ratio of 1.38:1). The total area "gained" that we measured through out GPS survey was approximately 226 acres. This value assumes that the 15 mitigation sites with undeterminable boundaries resulted in zero acres of gain each. This was certainly not the case as at least some of these sites did have evidence of mitigation activities, but this figure reflects the lower limit of the total mitigation acreage "gained." If this were the case, the total mitigation acreage for these 50 sites would have been short of the permit requirement by 7 acres, though it would have resulted in a net gain of 56 acres over the permitted impacts, for a gain/loss ratio of 1.33:1. To establish an upper limit for the possible mitigation acreage gained, we assumed that the 15 sites with undetermined boundaries had met their acreage requirement exactly. This was also not the case, as there were clear deficiencies at many of the sites, with no evidence of mitigation activities at some and essentially no vegetative cover at others. With this more generous assumption, the total mitigation acreage would be 262 acres, which would exceed the required acreage by about 29 acres and the impact acreage by 92 acres, yielding a gain/loss ratio of 1.54:1. While it is not known where the true acreage lies within these limits, the mid point of this range (226 to 262 acres) is 244 acres, which just barely meets the acreage requirement (+7 acres) and exceeds the acreage lost by almost 74 acres, which would yield a gain/loss ratio of 1.44:1.

As a separate analysis, we excluded the 15 sites with undetermined boundaries from our set of acreage calculations, and the last two columns of Table 13 show the resulting information. As the totals for last two columns show, without these 15 sites the acreage "gained" becomes 226.12 acres, which exceeds the required acreage by 28.55 acres and yields a gain/loss ratio of 1.62:1. While they are not shown in Table 13, these values for the total acreage lost and the total acreage required, excluding the 15 sites, are 139.36 and 197.57 acres respectively.

Comparing the expected (required) mitigation ratio (1.38:1) to both the midpoint ratio of our 50 permit file range (1.44:1), and the ratio obtained excluding the 15 sites where acreage couldn't be assessed (1.62:1), it would appear that overall, mitigation projects in the Los Angeles region are meeting or slightly exceeding their acreage requirements. Therefore, it might be assumed that losses to wetlands and non-wetland waters permitted under Sections 401 and 404 of the Clean Water Act are being offset by adequate gains in acreage through compensatory mitigation requirements. It is unclear whether this same result would be found if we considered loss estimates to "waters of the state" under the extended jurisdictional authority of California's state agencies. Furthermore, since a substantial proportion of these mitigation projects are enhancements and preservation areas (which may increase or preserve function, but do not constitute gains in habitat), these acreage "gained" results may not reflect the true ratio of replaced wetland or non-wetland waters habitat. Additionally, these results do not indicate whether or not the habitat type and ecological function lost at impact sites are being adequately replaced by comparable habitat and function at mitigation sites. These issues will be addressed in the next section of the report.

5.4. Functional Evaluation

Using the CRAM wetland class designations, the vast majority of mitigation sites in our study were "riverine" (Figure 22). We also assessed four estuarine sites, one lacustrine site, and one "spring and seep" site. The results from our un-modified CRAM evaluation for all 79 mitigation sites, including all CRAM letter scores and numerical stressor index scores, are given in Table 14. These data were collected according to the precise rules of CRAM as specified in version 2.0. Beyond displaying standard CRAM results here for reference, no further analyses or utilization of these data will be included in this report. Instead, we have chosen to emphasize our UCLA-CRAM results, as these data enabled the individual metrics to be combined into "totals" scores by individual mitigation site and by permit file. We use these UCLA-CRAM scores as our primary indicator of functional success.

The results from our functional evaluations at all 79 individual mitigation sites, presented as the raw scores along the linear 1-12 scale, are given in Table 15. These results are summarized graphically in a series of five figures. First, we show all the results from Table 15 combined into a single UCLA-CRAM score. The next four figures show the results displayed as scores for each of the four major CRAM components (landscape context, hydrology, abiotic structure, and biotic structure). The overall score and scores for the four components are summarized in Table 16 in terms of optimal wetland condition (>79.2% of total possible points), sub-optimal wetland condition (between 54.2% and 79.2%), and marginal to poor wetland condition (<54.2%).

The conditions at the 79 mitigation sites varied from 17% to 84% of the total UCLA-CRAM points possible (Figure 23). Twenty-three of the 79 sites (29%) had scores less than 54.2% of the total possible points, considered to be of marginal to poor condition. Fifty-three of the 79 sites (67%) had sub-optimal condition, and only three sites (4%) exceeded 79.2%, the criterion we determined to represent optimal wetland condition. The mean score of all sites was 56.4±1.8% (mean±standard error) and the median score was 59.4.

The results from the landscape context component of UCLA-CRAM, which combines metrics for the percent of the mitigation site with buffer, buffer width, buffer condition, and the linear contiguity of habitat (its function as a wildlife corridor), are presented in Figure 24. Thirty-four sites (43%) scored less than 54.2% of the possible points, scoring as marginal to poor. Thirty-eight sites (48%) were sub-optimal, with 7 optimal sites (9%). The mean score of all sites was 52.3±2.5% and the median score was 57.3. This mean landscape context score was slightly lower than the total UCLA-CRAM mean, and the data were distributed more widely.

The results from the hydrology component of UCLA-CRAM, which combines metrics for water source, hydroperiod, and upland connection, are presented in Figure 25. Eighteen sites (23%) had marginal to poor condition, scoring less than 54.2%. Fifty-four sites (68%) were sub-optimal, with 7 optimal sites (9%). The mean score of all sites was 61.3±1.8%, somewhat higher than the total mean. The median score was 63.9. These data appear normally distributed, but with a slight skew towards higher scores.

The results from the abiotic structure component of UCLA-CRAM, which combines metrics for abiotic patch richness, topographic complexity, and sediment integrity, are presented in Figure 26. Twenty-nine sites (37%) scored less than 54.2%. Thirty-six sites (45%) were sub-optimal, with 14 optimal sites (18%). The mean score of all sites was 57.1±2.4%, somewhat higher and more widely distributed than the total mean. The median score was 61.1. These data do not appear to be normally distributed.

The results from the biotic structure component of UCLA-CRAM, which combines metrics for organic matter accumulation, biotic patch richness, vertical structure, interspersion and zonation, and plant community integrity, are presented in Figure 27. Thirty-one sites (39%) scored less than the marginal score of 54.2%. Forty-one sites (52%) were sub-optimal, with 7 optimal sites (9%). The mean score of all sites was 55.1±2.0%, which is somewhat lower than the total mean. The median score was 58.3. These data also appear somewhat non-normally distributed.

For the most part, these overall UCLA-CRAM scores are well distributed across the full range of possible scores for this set of 79 mitigation sites. The distribution of overall UCLA-CRAM scores combined across all four CRAM categories appeared normally distributed, though perhaps biased away from very high or very low scores. This lends support to the usefulness of this UCLA-CRAM evaluation in the assessment of wetland function at mitigation sites. The abiotic structure and biotic structure categories seem a somewhat less robust given their departure from a normal distribution. Whether this is due to particular metrics may be discerned in the following series of figures which display the UCLA-CRAM results by individual evaluation metric.

The following sections present results for the individual UCLA-CRAM metrics, organized into the four main CRAM components: landscape context, hydrology, abiotic structure, and biotic structure. For all of the figures summarizing individual metrics, we have included dashed vertical lines to demarcate the four general categories of optimal, sub-optimal, marginal, and poor.

5.4.1. Landscape context

The results for the "% assessment area with buffer" metric are given in Figure 28. The mean score among the 79 individual mitigation sites was 7.2 for this metric, which is in the sub-optimal category. The median score was 7.0. Twenty five of the sites (32%) scored as optimal, 25 sites (63%) were sub-optimal, and 29 sites (37%) had marginal to poor wetland condition.

For "average buffer width," the mean score was 9.1, which was the second highest of all the evaluation metrics (Figure 29) and at the upper end of the sub-optimal category. The median score was 11.0. Forty-nine sites (62%) were optimal, 15 sites (19%) were sub-optimal, and 15 sites (19%) were marginal to poor.

For "buffer condition," the mean score was 8.3, with 29 (37%) optimal sites, 35 (44%) sub-optimal, and 15 (19%) marginal to poor sites (Figure 30). The median score was 9.0.

For "linear contiguity," the mean score was also 8.3, but with a much higher number of optimal sites (45, or 57%), and a higher number of marginal to poor sites as well (23, or 29%) (Figure 31). Nine sites (11%) were sub-optimal. The median score was 10.0.

All of these landscape context metric means were equal to or higher than 7.2, which is the arithmetic average of all 15 CRAM metric means. However, the means for these categories can not be compared directly to the means for the total landscape context score (Figure 24) because for each site, the scores for the first three metrics were multiplied together and then averaged with the linear contiguity score yield that total score. Note that the linear contiguity metric was not part of the standard CRAM assessment, but was an addition used only in our UCLA-CRAM evaluation.

5.4.2. Hydrology

The results for the "source of water" metric are given in Figure 32. The mean score among the 79 individual mitigation sites was 6.9 for this metric, which is just below the cut-off for sub-optimal. The median score was 7.0. Only 3 sites (4%) scored in the optimal category, while 47 sites (59%) were sub-optimal and at 29 sites (37%) the score reflected marginal to poor wetland condition.

For "hydroperiod," the mean score was 7.0 with 9 (11%) optimal sites, 52 (66%) sub-optimal sites, and 18 (23%) marginal to poor sites (Figure 33). The median score was 8.0.

For "upland connection," the mean score was 8.2% with 26 optimal sites (34%), 34 (44%) sub-optimal sites, and 17 (22%) marginal to poor sites (Figure 34). The median score was 9.0. Two sites could not be assessed for upland connection because this metric did not apply to their hydrogeomorphic class ("spring and seep" and "lacustrine").

Both the "source of water" and "hydroperiod" means were lower than the averaged CRAM metric mean of 7.2, while the "upland connection" mean scored higher. This pattern holds up when these metric means are compared to the hydrology "totals" mean (Figure 25), which was 61.3%, or approximately 7.4 on the 1-12 scale.

5.4.3. Abiotic Structure

The results for the "abiotic patch richness" metric are given in Figure 35. The mean score among the 79 sites was 5.8 for this metric, which would be considered marginal to poor condition. The median score was 6.0. Twelve sites (15%) were optimal, 25 (32%) were sub-optimal, and 42 sites (53%) had marginal to poor wetland condition.

For "topographic complexity," the mean score was 7.1 with 22 optimal sites (28%), 29 sites (37%) sub-optimal, and 28 sites (35%) were marginal to poor (Figure 36). The median score was 8.0.

For "sediment integrity," the mean score was 7.6, with 14 optimal sites (18%), 48 (61%) sub-optimal, and 17 marginal to poor sites (22%) (Figure 37). The median score was 8.0.

Both the "abiotic patch richness" and "topographic complexity" means were lower than the averaged CRAM metric mean of 7.2, while the "sediment integrity" mean scored higher. At 5.8, the "abiotic patchness" mean was notably low.

5.4.4. Biotic Structure

The results for the "organic matter accumulation" metric are given in Figure 38. The mean score among the 79 sites was 7.5 for this metric. The median score was 8.0.

Twenty-two sites (28%) had optimal condition, 30 sites (38%) were sub-optimal, and 27 sites (34%) were marginal to poor.

For the "biotic patch richness" metric, the mean score was just 4.7, with no optimal sites, 18 sites (23%) sub-optimal, and 77% of the sites with marginal to poor condition (61 sites) (Figure 39). The median score was 4.0.

For "vertical structure," the mean score was nearly as low at 5.2. For this metric, only 7 sites (9%) were considered optimal, 16 sites (20%) were sub-optimal, while a high number 71% (56 sites) were marginal to poor (Figure 40). The median score was 5.0.

For "interspersion and zonation," there was a low mean of 6.0 with 19 sites that were optimal (24%), 18 sites (23%) that were sub-optimal, and 42 sites (53%) that were marginal to poor (Figure 41). The median score was 6.0.

For "plant community integrity," the mean score was 9.7, the highest of all the CRAM metrics (Figure 42). Fifty-seven of the sites (72%) were considered optimal for this metric, 11 sites (14%) were sub-optimal, and only 11 sites (14%) were marginal to poor with respect to invasive species. The median score was 11.0.

As a whole the biotic structure metrics showed the greatest variability in mean scores compared to the other three categories. Three of the five metrics were below the CRAM metric average of 7.2 while two metrics were higher. The plant community integrity metric had very high scores. As written in CRAM version 2.0, the emphasis of the scoring criteria for this metric was the dominance of invasive species within the assessment area. For the most part, the mitigation sites we surveyed were not dominated by invasive species, though non-native plants were usually present. Future versions of CRAM will likely replace the scoring criteria for this metric with criteria that emphasize plant species diversity.

Both the abiotic patch richness metric and the biotic patch richness metric yielded low mean scores for these 79 mitigation sites. This is not surprising since the scoring criteria for both of these metrics are size dependent. That is, since a site scores higher as it contains more patch types, larger sites are naturally expected to contain more patch types than smaller sites due to size alone. Since mitigation sites frequently have small assessment areas compared to natural wetlands, these two metrics may underestimate their actual function. Future versions of CRAM may modify these metrics to avoid this scaling problem.

As is clear from earlier tables and figures, not all compensatory mitigation projects include wetland hydrology, biogeochemistry, and hydrophytic vegetation as target endpoints. In these cases, a CRAM score of 100% may not be an appropriate expectation. On the other hand, since the principle behind the Clean Water Act regulation is protection of wetland functions and values, and because the regulatory framework is limited to the acreage of jurisdictional wetlands and waters, we feel that the target endpoint of a 100% CRAM score is appropriate for evaluating compensatory mitigation sites permitted under CWA sections 401 and 404[6].

5.5. Supplemental Functional Evaluations

Included in this section are the results from most of the supplemental qualitative assessments that were done in addition to the CRAM and the supplemental UCLA-CRAM evaluations for each of the 79 individual mitigation sites. The categories that make up these supplemental assessments include: the supplemental qualitative assessment, the jurisdictional habitats assessment, the wetland indicator assessment, and the services lost versus gained assessment. We also collected data for a supplemental evaluation of the presence of wildlife assessment. However, data from this evaluation are not included here because the results were inconclusive and do not add significantly to this report or the overall findings of the study.

Note: An additional supplemental evaluation, the wetland evaluation assessment (WEA), is presented in Appendix 8: Wetland Evaluation Assessment (WEA).

5.5.1. Supplemental Qualitative Assessments

CRAM is a comprehensive evaluation protocol developed to assess the overall condition of wetland sites. As with all such methodologies, there are limitations to what CRAM evaluates. We extended the scope of CRAM's assessment through supplemental qualitative assessments. These supplemental assessments consist of a collection of unrelated individual assessments that will be treated independently. These cannot be summed or averaged to yield a supplemental function score. Included in this collection are estimates of plant density and diversity, total native cover and total cover of invasive species, and the percent cover of *Arundo donax*, a particularly troublesome invasive plant in the Los Angeles region. We also focus on one relevant stressor, the influence of impervious substrate on the sites. Additional assessments were made that focus on how successful the mitigation project was with respect to its potential longevity, its ability to persist without artificial watering, and the overall quality of the habitat. The final three assessments consider how successful the mitigation activities were in replacing lost function, how successful the permittees were in satisfying their permit obligations, and how appropriate those permit obligations were in guaranteeing that the goal of "no net loss" of remaining wetland habitat and function would be met, as approved. All these supplemental qualitative assessments were scored using the same linear 1 to 12 scale as in the UCLA-CRAM evaluation. The results for all these assessments are given in Table 17 as raw scores.

[6] In the future, it would be useful to conduct an evaluation at a series of reference sites designed to replicate the conditions typical of impact project sites prior to habitat loss. It may be that highest attainable UCLA-CRAM score at these sites is less than 100%, so that the expected score for success could be adjusted downward. However, unless such a study indicates that a downward adjustment is justified, we feel it is best to maintain an expectation of high function and condition. A preliminary review of data collected during the validation stage of CRAM, which included riverine wetlands spanning the range of high to low condition, provided no reason to reject our approach, since the total points for 5 of the 16 sites (31%) would have been considered "optimal" by our criteria.

The results for the "plant density" assessment are presented in Figure 43. As can be seen in this figure, the plant density within most compensatory mitigation sites was appropriate with the principle mode at the lower range of optimal. The mean score among the seventy nine sites was 8.7 or 73%, which could be considered partially successful. The median score was 10.0. For 43 sites (54%), the plant density estimates fell within the "optimal" category, and were thus considered successful, 22 sites (28%) were partially successful, and 14 sites (18%) fell below the "sub-optimal" category and were considered failures.

The results for "plant diversity" are presented in Figure 44. Similar to plant density, the plant diversity at most sites was appropriate, with the principle mode at the lower range of optimal. The mean score among the seventy nine sites was 8.4 or 70%, which is partially successful. The median score was 10.0. Forty-four sites (56%) were successful, 15 (19%) were partially successful, while 20 (25%) were failures.

The results for "total native plant percent cover" are presented in Figure 45. The percent cover of native plants was appropriate at most of the sites, with the principle mode at the lower range of optimal. The mean score among the seventy nine sites was 7.9 or 66%. The median score was 9.0. Thirty-five sites (44%) were considered successful, 19 (24%) were partially successful, while 25 sites (32%) were failures.

The results for "total invasive plant % cover" are presented in Figure 46. The percent cover of invasive plants at most sites was appropriately low. The mean score among the seventy nine sites was 9.6 or 80%. The median score was 10.0. Fifty-five sites (70%) were considered successful, 16 sites (20%) were partially successful, while just eight sites (10%) had inappropriately high cover of invasive plants and were considered failures.

The results for "*Arundo donax* presence" are presented in Figure 47. The vast majority of the sites had little or no *Arundo donax* and fell into the "high optimal" category with respect to this invasive plant. The mean score among the seventy-nine sites was 11.2 or 93%. The median score was 12.0. Sixty-nine sites (87%) were successful, 6 sites (8%) were partially successful, and only 4 (5%) were failures.

Taken together, the above supplemental assessment results indicate that most compensatory mitigation sites are achieving high success with respect to their plant communities. This confirms our general impression that the planting element of compensatory mitigation projects is the aspect of wetland replacement that both agency personnel and permittees focus on most. None of the above criteria evaluates the composition of the mitigation site plant community to determine if those plants are obligate or facultative wetland species, or upland species. Although this was not part of our assessment, our observations are that most of the mitigation site acreage surveyed in this study consists of facultative wetland/riparian and upland species.

The results for the influence of "impervious substrate" are presented in Figure 48. The purpose of this assessment was to evaluate the extent to which impervious substrates, both within the site and in the surrounding landscape, may influence the mitigation site through increases in flashy runoff and added pollution. The distribution of scores was bimodal for impervious substrate with modes in the optimal and marginal categories. This suggests that the majority of mitigation sites are located either in sparsely developed areas or in heavily developed areas. The mean score among the seventy nine sites was 7.4 or 62%. The median score was 7.0. Thirty-two sites (40%) are successful, 10 sites (13%) were partially successful, and 37 sites (47%) were failures.

The results for “site longevity” are presented in Figure 49. Through this evaluation, we assessed the likelihood that the condition and/or function of the site will degrade substantially over time due to improper positioning of the site within the landscape, the projected domination by invasive species, the chance of direct alteration of the site by future human activities, or for some other reason. The mean score among the seventy nine sites was 8.4 or 70%. The median score was 9.0. Thirty eight sites (48%) were considered successful, 20 sites (25%) were partially successful, while 21 (27%) were considered failures. These figures indicate that, while there are some problematic sites, the majority of sites will likely continue to provide the same or more functions and services as at the time of this study. This statement does not indicate whether those functions and services were appropriate at the time of the study.

The results for our assessment of the ability for plants to “survive without artificial water” at the mitigation site are presented in Figure 50. At the majority of mitigation sites, we expect that the plantings will survive without water once irrigation ceases. The mean score among the seventy nine sites was 9.4 or 78%. The median score was 10.0. Fifty two sites (66%) were considered successful, 12 sites (15%) were partially successful, and 15 sites (19%) were considered failures. This finding is encouraging, given the findings of previous studies that the success of many mitigation sites is irrigation-dependent (e.g., Sudol 1996). Because we do not have data on the composition of plant species and especially obligate wetland species, we cannot say how much the success of this metric is influenced by plant species composition at the mitigation sites. Certainly, obligate wetland plant species, facultative wetland/riparian species, and upland species do not all have the same water requirements.

The results for “overall quality of habitat” are presented in Figure 51. The purpose of this assessment was to consider all aspects of the mitigation site and to use best professional judgment, and the guidelines of our criteria, to obtain a single qualitative score for site condition that could be compared to the UCLA-CRAM data. Through this assessment, we considered the quality of the site’s habitat for what it was, not for what it should have been as stated in the permit or as per the general goals of the Clean Water Act. We did not consider whether the mitigation site or the mitigation activities adequately replaced the habitat, functions, or services that were lost. We did not consider the extent of the mitigation activities in improving the site compared to its pre-mitigation state. This assessment can simply be viewed as the overall quality of the habitat of the mitigation site, given the habitat type, topography, and landscape context, that characterized the sites. The resulting mean score among the 79 sites was 7.0 or 58%; by comparison, the UCLA-CRAM “totals” results had a mean score of 56.4%. The median score was 8.0. Twenty two sites (28%) were successful for “overall quality of habitat,” 26 sites (33%) were partially successful, while 31 sites (39%) were failures. By comparison, the UCLA-CRAM “totals” results had 3 sites (4%) considered successful and 23 sites (29%) considered failures. The mean “overall quality of habitat” score was similar to the UCLA-CRAM mean, but many fewer sites were judged optimal by UCLA-CRAM, perhaps because UCLA-CRAM expects the sites to have wetland qualities. However, about ten percent more sites were considered failures compared to CRAM. These discrepancies suggest that many high quality mitigation sites exist, but they are not high-quality wetlands. Conversely, these results suggest that many low quality mitigation sites exist but these are given moderate scores by CRAM (and WEA; see Appendix 8: Wetland Evaluation Assessment (WEA)) simply because they are located in an area of favorable hydrology or landscape position. Our observations support this finding; for example, at least two mitigation sites with low habitat quality (poor vegetation cover and diversity, minimal aquatic or other wildlife habitat) were given non-failing CRAM scores because they were located within an active flood plain. Although CRAM may be accurately reflecting the condition of the site with regards to its interactions with adjacent habitats, it is overestimating the gain in wetland functions or services achieved by mitigation in these cases, since the high score has nothing to do with the activities undertaken as mitigation.

The results for “overall success of functional replacement” are presented in Figure 52. For this assessment we considered what was actually accomplished at a mitigation site (the functional difference between the pre-mitigation state and post-mitigation state of the site) compared to the functional losses that occurred at the impact site. This was, of course, not simple or straightforward, since we had no direct experience with the pre-project states of either the impact site or the mitigation site. However, for all projects, there was information available in the files to infer the likely conditions of these sites before project activities. Sources of this information came directly from the permit files in the form of project and mitigation site descriptions, photographs of the sites before and after work began, information included in the general permit paperwork, correspondence, mitigation plans, and mitigation reports. We were almost always able to view the impact project during our field visits and in doing so, we considered the general landscape position of the site as well as the condition of nearby, undeveloped sites of the same landscape position. Aerial photographs taken of the sites were also useful in this regard. Occasionally, we gleaned information about the pre-project states of the impact and mitigation sites through discussions with individuals knowledgeable about the project. While this is clearly no substitute for full before/after studies of impact and mitigation sites, we feel confident that the best professional judgment we used in this assessment has yielded a meaningful approximation of the how successful the mitigation efforts were in replacing lost function. The mean score among the 79 sites was 6.4 or 53%. The median score was 6.0. Twenty three sites (29%) were successful, 10 sites (13%) were partially successful, while 46 sites (58%) were failures. Compared to the “overall quality of habitat” assessment above, about as many sites were considered successful but nearly 20% more sites failed with respect to functional replacement (46 versus 31 sites). The higher failure rate for this metric means that some sites did not replace the functions of the impacted sites even though they may not have failed in terms of providing a quality habitat.

The results for “overall success in achieving stated goals of mitigation plan/permit requirements” are given in Figure 53. For this assessment we considered whether or not the permittees adequately fulfilled their mitigation related responsibilities, as outlined in the permits and mitigation plans approved by regulatory agencies. The resulting mean score among the seventy nine sites was 8.0 or 67%, but the distribution was somewhat bimodal. The median score was 10.0. Forty two sites (53%) were considered successful, 10 sites (13%) were partially successful, and 27 sites (34%) were failing. Compared to the habitat quality and functional replacement assessments above, the success scores for this assessment were higher by about 20 percentage points, indicating that many mitigation projects accomplished the goals set out for them but nonetheless failed to replace the lost functions from the impacted sites. From the results of these two assessments, one might conclude that the mitigation goals have not been set high enough to ensure that mitigation sites achieve the functions necessary to replace the impact site's functions adequately.

The results for "appropriateness of approved permit conditions" are presented in Figure 54. The purpose of this assessment was to consider how appropriate the planned mitigation activities, which were approved by regulatory agencies, were in meeting the "no net loss" goal had they been carried out with 100% compliance. Through the permit process the prospective impact site is surveyed by a professional wetland delineator and estimates for both temporary and permanent impacts to wetland and non-wetland waters are made. Given the quality of the habitat to be lost at the impact site, the permittee (or the permittee's consultant) proposes the location(s), mitigation types, and habitat types to be included as compensatory mitigation for the expected losses. Regulatory personnel generally consider this information, confirm the proposed mitigation acreage (perhaps with modification to achieve a desired mitigation ratio), attach a set of standard and special conditions, and conditionally approve the permit pending their approval of the subsequent mitigation plan. While the proposed mitigation sites and activities may sound appropriate on paper, the actual landscape position of the mitigation site and/or the planned mitigation activities may be less appropriate for achieving the "no net loss" goal. With these issues in mind, we assessed whether the approved permit conditions would fully compensate for the lost resources and functions, assuming the mitigation site had met all conditions. The mean score for this assessment was 7.0 or 58%. The median score was 7.0. Twenty-four sites (30%) were considered successful, 19 sites (24%) were partially successful, while 36 sites (46%) were failures. Compared to the above assessment of the permittee's success in fulfilling their mitigation requirements, this assessment of the appropriateness of those requirements resulted in a mean score that was almost 10 percentage points less. Eighteen fewer sites (26%) were successful while nine more sites (11%) failed. These results suggest that the lower scores for site function that we reported previously are due in part by permit conditions that do not ensure full and complete compensation for losses.

5.5.2. Jurisdictional Habitats Assessment

While wetland delineations at proposed impact sites are a required step in the permit process, there is no requirement that analogous wetland delineations be performed at mitigation sites to ensure that adequate acreage of jurisdictional habitat is created, restored, or enhanced. Performing full legal wetland delineations at mitigations sites was beyond the scope of this project. However, at each mitigation site we made a qualitative assessment of the approximate proportions of jurisdictional and non-jurisdictional habitat types that would have been recorded had such wetland delineations been made. The results of these assessments for all 79 individual mitigation sites are given in Table 18. In this assessment, the first distinction we made was between that portion of the site that was within the ordinary high water mark of the waterbody including adjacent wetlands, that is, "waters of the United States," and the remaining portion of the site. The "non-waters" area was apportioned into riparian habitats and upland habitats. The "waters of the US" area was apportioned into wetland habitats and non-wetland waters. In both 401 and 404 permits, these non-wetland waters are often, but inconsistently, broken down into more specific categorizations such as "streambed," "open water streambed," "unvegetated streambed" and "vegetated streambed" habitats, but are often simply referred to by some other description such as "riparian waters." We followed this same approach in subdividing the non-wetland waters category, but in a way that would enable back-consolidating categories in an unambiguous way. Non-wetland waters categorized as "other" were almost exclusively those riparian waters habitats that were within the ordinary high water mark of the waterbody, but beyond the channel or adjacent wetlands. The most clear definition of "riparian" specifies those areas that are "…adjacent to perennial, intermittent, and ephemeral streams, lakes, and estuarine-marine shorelines" (NRC 2002). But in regular use, and in the permit files, there is substantial ambiguity in the application of "riparian," with reported impacts to riparian waters that may or may not include the channel itself. This ambiguity makes it difficult for us to compare our riparian waters category to those from the permit files.

In the following series of eleven figures we present the information from Table 15 graphically, showing the frequency distribution of sites along a percentage scale from 0 to 100 for each jurisdictional habitat type. The bars to the left in these figures show the sites that are only scarcely composed of a given habitat type, or where that habitat type is absent from a particular mitigation site, and the bars to the right indicate those sites that are largely composed of that habitat type.

A histogram showing the frequency of sites composed of "waters of the United States" is displayed in Figure 55. As can be seen in this figure, most sites are either composed of a relatively high or a relatively low percentage of "waters" habitat. Thirty-nine percent of the sites were greater than 70% waters, while 38% were less than 30%. The mean and median percentage of "waters" habitat was 50%.

Wetland habitat was uncommon at these 79 mitigation sites with 76% of sites having less than 30% wetland and 11% having greater than 70% (Figure 56). The mean percentage of wetland habitat was 18%. The median percentage was 0%. The mean percentage of "non-wetland waters" habitat was 32% (Figure 57). The median percentage was 20%. Fifty-eight percent of the sites had less than 30% non-wetland waters habitat, while 19% had greater than 70%. An individual site's scores for wetlands and non-wetland waters sum to equal the waters of the United States score.

Non-wetland waters habitat is composed of "streambed" habitats and "other" habitats. Streambed habitat was uncommon at most mitigation sites (Figure 58) with 70% of sites having less than 30% streambed and only 14% having greater than 70%. The mean percentage of streambed habitat was 23%. The median percentage was 0%. Three habitat types, open water, unvegetated streambed, and vegetated streambed, combine to equal the previous streambed percentages. Open water habitat made up only a small proportion of our 79 mitigation sites (Figure 59), comprising less than 10% of the area at all mitigation sites. Unvegetated streambed habitat was uncommon at most mitigation sites, with 16% of sites having less than 30% unvegetated streambed and only 5% having greater than 70% (Figure 60). The mean percentage of unvegetated streambed habitat was 12%. The median percentage was 0%. Vegetated streambed habitat was equally uncommon at most mitigation sites with 87% of sites having less than 30% vegetated streambed and only 4% having greater than 70% (Figure 61). The mean percentage of vegetated streambed habitat was 10%. The median percentage was 0%. Results for the remaining non-wetland waters habitat type, the "other" category, are given in Figure 62. This category was used primarily to delineate those sections of the riparian habitat that were within the ordinary high water mark of the associated channel. Ninety percent of sites had less than 30% "other" habitat while 6% had greater than 70%. The mean percent of "other" habitat was 9% and the median was 0%.

The remaining proportions of the mitigation sites, which were not classified as waters of the United States, were considered "non-waters of the United States." A substantial amount of non-waters habitat was found at these 79 mitigation sites (Figure 63). Thirty-seven percent of the sites were greater than 70% non-waters, while 41 % were less than 30%. The mean percentage of "non-waters" habitat was 49%. The median percentage was 50%. This non-waters habitat, which is does not fall with the limits of federal jurisdiction, is comprised of the remaining two habitat types, riparian habitat and upland habitat. Riparian habitat was relatively common at most mitigation sites (Figure 64), with 57% of sites having less than 30% riparian habitat and 8% having greater than 70%. The mean percentage of riparian habitat was 28%. The median percentage was 25%. Upland habitat was also relatively common at most mitigation sites (Figure 65) with 67% of sites having less than 30% upland and 8% having greater than 70%. The mean percentage of upland habitat was 23%. The median percentage was 10%.

Taken together, these jurisdictional habitat results indicate that there is a substantial amount of non-jurisdictional riparian and upland habitat in the surveyed compensatory mitigation sites. Upland habitat and riparian habitat that is beyond the limits of federal jurisdiction (waters of the United States) are not included in the estimates of habitat losses that result from the formal permitting process. Nor are losses to these habitats considered when determining the acreage requirement of Section 404, or 401 permits (although the riparian habitats that are beyond federal jurisdiction may be considered "waters of the state," and may thus be included in the acreage requirements of the California Department of Fish and Game *streambed alteration agreement*). As a consequence, a simple balance-sheet approach to assessing no net loss, where acres impacted are compared to acres mitigated, can be misleading, since the loss acreage does not include non-waters habitats but the mitigation habitat does[7]. In any case, it seems that through the Section 401 permits, a shift is occurring wherein wetlands and other waters of the United States are being replaced to a certain extent by non jurisdictional riparian and upland habitats. This will be discussed further below.

[7] Of course, there are other complications as well, not the least of which is the question of whether the mitigation sites function as well as the sites that were impacted.

5.5.3. Wetland Indicator Assessment

To determine the proportion of mitigation sites that had wetland characteristics, we performed a three-parameter wetland indicator assessment in which the 79 mitigation sites were evaluated for (1) wetland hydrology, (2) hydric soils, and (3) hydrophytic vegetation.

The results for hydrology are displayed in Figure 66. For this evaluation, and similarly for the two that follow, at least 75% of the site area must possess wetland hydrology to be considered optimal (see Appendix 2:). As can be seen in this figure, the distribution of hydrology scores was trimodal with one mode in the lowest scoring category "low-poor", another at "high-marginal," and another at "mid-optimal." Only one site was considered "high-optimal." The mean and median hydrology indicator score among the seventy nine sites was 6.0 or 50%. Nineteen sites (24%) were considered successful, 15 sites (19%) were partially successful, while 45 sites (57%) were failing.

The results for hydric soils are displayed in Figure 67. The distribution of scores was spread quite evenly, except for one mode in the "low-poor" category and the absence of any high optimal scores. Almost one quarter of the sites (24% or 19 sites) were assigned the lowest possible score for hydric soils. The mean score among the 79 sites was 4.9 or 41%. The median score was 4.0. Fourteen sites (18%) were considered successful, 17 sites (21%) were partially successful, while 48 sites (61%) were failing. The low score for hydric soils is not surprising since it is known that many "wetlands" in southern California and the arid southwest do not develop hydric soils; in fact, the Corps' three-parameter criterion for wetlands has been criticized for this reason.

The results for hydrophytic vegetation are displayed in Figure 68. The distribution of hydrophytic vegetation scores was evenly distributed, but with a primary mode at "mid- to high-optimal." Moderately higher scores were found for the "low-marginal" scoring category as well as for the "middle sub-optimal" category, compared to the remaining distribution of scores. The mean score for among the seventy nine sites was 7.2 or 60%. The median score was 8.0. Twenty six sites (33%) were considered successful, 19 sites (24%) were partially successful, while thirty four sites (43%) were failing.

It appears that mitigation sites are more successful in exhibiting wetland vegetation than wetland hydrology, and both of these are more commonly found at mitigation sites than hydric soils.

5.5.4. Services Lost vs. Gained Assessment

Wetland protection under the Clean Water Act and the goal of "no net loss" is founded on the concept that wetlands and other "waters of the United States" provide valuable functions, values, and services that are important and beneficial to humans. As humans have destroyed, modified, or have otherwise encroached upon estuaries, flood plains, drainage courses, and geographically isolated wetlands, many of the beneficial services once provided by those aquatic habitats have either disappeared or are greatly reduced. Examples of such services include flood water storage, flood energy dissipation, biogeochemistry (e.g., water purification, nutrient cycling), sediment accumulation, wildlife habitat including aquatic wildlife habitat, and in some cases, groundwater recharge. Following the standard sequencing procedures, and the resulting avoidance and minimization of many proposed impacts to wetlands and waters, most remaining impacts are ultimately permitted as they are deemed to be in the greater public interest. Because regulatory personnel cannot force a permittee to perform mitigation measures that would render the original project unviable, such as expensive land acquisitions, their guidelines allow losses of one habitat type to be offset by another habitat type provided that an appropriate mitigation ratio be employed. This practice has resulted in the shift in jurisdictional habitats that we reported in Section 5.5.2. Nonetheless, the practice is justified based on an assumption that the functions and services lost at the impact site are being adequately replaced by mathematically equivalent functions or services gained at through the mitigation measures.

To assess whether lost functions and services actually are replaced by mitigation activities, we compared the services occurring at mitigation sites to what was lost through project impacts. For each of the services listed above (except ground water recharge, which is not relevant at most of our riverine sites), we considered what the realized gains were through mitigation activities and what the likely losses were at the impact sites. This assessment employed the same approach as was already described for the "functional replacement" portion of the supplemental qualitative assessment. Using all information that was available, we determined the losses compared to gains and did so using a linear 1-12 scale. A full description of this approach, including illustrative examples, is given in the methods section. To analyze these data, we subtracted the loss score from the gain score for every service assessment, and then we display the results on a number line centered around zero (complete replacement) so that negative numbers represent net losses and positive numbers represent net gains. We will refer to the scale intervals as "service units." For each of the service category results given below, we consider success as meeting or exceeding full replacement (zero or higher score), and we consider failure as falling below a score of -1 service units. Partial replacement is defined as -1 service unit, or for the "totals" calculations, between this value and zero. Sites with service unit scores below -2 were considered "extreme failures."

The results for the loss versus gain analysis for flood storage services are presented in Figure 69. The majority of the mitigation projects (58% or 46 sites) did not adequately compensate for the flood storage services lost at the impact sites. Sixteen sites (21%) had a net loss/gain of zero, while 17 sites (22%) achieved a net gain of flood storage services. Replacement could be considered successful (zero or greater) at 33 sites (42%), while replacement failed (< -1 score) at 31 sites (39%). Twenty five sites (32%) were considered extreme failures. At 61% of the sites (48 sites), at least partial replacement of services occurred. These total services lost/gained results appear to be normally distributed, around a low mean of -1.4 service units and a median of -1.0.

The results for the loss versus gain analysis for flood energy dissipation services are presented in Figure 70. Almost half of the mitigation projects (47% or 37 sites) did not adequately compensate for the flood energy dissipation services lost at the impact sites as indicated by negative numbers. Seventeen sites (22%) had a net loss/gain of zero, while 25 sites (27%) achieved a net gain of dissipation services. At 42 sites (53%), replacement could be considered successful (zero or greater), while at 26 sites (33%), replacement failed (< -1 score). Twenty one sites (32%) were considered extreme failures. At 53% of the sites (42 sites), at least partial replacement of services occurred. The mean flood energy dissipation services lost/gained was -0.8 service units and the median score was 0.0.

The results for the loss versus gain analysis is for biogeochemistry services are presented in Figure 71. Over half of the mitigation projects (58% or 46 sites) did not adequately compensate for the biogeochemistry services lost at the impact sites as indicated by negative numbers. Fourteen sites (18%) had a net loss/gain of zero, while a net gain of biogeochemistry services was achieved for 19 sites (24%). At 33 sites (42%), replacement could be considered successful (zero or greater), while at 27 sites (34%), replacement failed (< -1 score). Nineteen sites (24%) were considered extreme failures. At 66% of the sites (52 sites), at least partial replacement of services occurred. The mean biogeochemistry services lost/gained was -0.8 service units and median score was -1.0. These results are striking given that the purpose of the Section 401 certifications is to assure that water quality won't be compromised.

The results for the loss versus gain analysis for sediment accumulation services are presented in Figure 72. Over half of the mitigation projects (51% or 40 sites) did not adequately compensate for the sediment accumulation services lost at the impact sites as indicated by negative numbers. Twenty two sites (28%) had a net loss/gain of zero, while a net gain of sediment accumulation services was achieved for 17 sites (22%). At 39 sites (49%), replacement could be considered successful (zero or greater), while at 29 sites (37%), replacement failed (< -1 score). Sixteen sites (20%) were considered extreme failures. At 63% of the sites (50 sites), at least partial replacement of services occurred. The mean sediment accumulation services lost/gained was a low -1.2 service units and the median score was -1.0.

The results for the loss versus gain analysis for wildlife habitat services are presented in Figure 73. Over half of the mitigation projects (59% or 47 sites) did not adequately compensate for the wildlife habitat services lost at the impact sites as indicated by negative numbers. Eleven sites (14%) had a net loss/gain of zero, while a net gain of wildlife habitat services was achieved for 21 sites (27%). At 32 sites (41%), replacement could be considered successful (zero or greater), while at 30 sites (38%), replacement failed (< -1 score). Twenty five sites (32%) were considered extreme failures. At 62% of the sites (49 sites), at least partial replacement of services occurred. The mean wildlife habitat services lost/gained was -0.8 service units and the median score was -1.0.

The results for the loss versus gain analysis for aquatic habitat services are presented in Figure 74. Just over half of the mitigation projects (51% or 40 sites) did not adequately compensate for the aquatic habitat services lost at the impact sites as indicated by negative numbers. Twenty five sites (32%) had a net loss/gain of zero, while a net gain of aquatic habitat services was achieved for 14 sites (18%). At 39 sites (49%), replacement could be considered successful (zero or greater), while at 23 sites (29%), replacement failed (< -1 score). Seventeen sites (22%) were considered extreme failures.

At 56% of the sites (71 sites), at least partial replacement of services occurred. The mean aquatic habitat services lost/gained was -0.8 service units and the median score was -1.0.

For each of the 79 mitigation sites, the above data were averaged across all six categories to obtain a single value for services lost versus gained, per site. These results are presented in Figure 75. As can be seen in this figure, the majority of the mitigation projects (66% or 52 sites) failed to adequately compensate for the beneficial services lost through impact projects. Replacement could be considered successful for 27 sites (34%), with 20 sites (25%) achieving a net gain of services and seven sites (9%), having a net loss/gain of zero. At 54% of the sites (43 sites), at least partial replacement of services occurred; in this case, this includes up to a small loss of services (-1.0 service units). Thirty-six sites (46%) failed to replace lost services, with 24 of these sites (30%) considered extreme failures. These total services lost/gained results appear to be normally distributed, around a mean of -1.0 service units and a median of -0.8. Thus for these 50 permit files there was a net loss of beneficial services, but since this value is within than the -1 service unit limit, this could be considered partial replacement overall.

5.6. Overall Summary of Results

In the previous section we presented the basic results for all the individual evaluation that were made. For some of those results, the most appropriate synthesis of the data was by permit file, while for others, it was by displaying the results by each of the individual mitigation sites. In this section we combine all elements of this study together to provide an overall summary of our findings. In doing so, we have performed some simple data operations to enable single "totals" calculations to be given for every assessed permit file. As stated earlier, a number of permit files consisted of two or more discrete mitigation sites that could not appropriately be combined into a single evaluation. Thus, separate evaluations were made for each of these sites to yield a total sample of 79 individual mitigation site evaluations for the 50 permit files included in our study. However, because it was desirable to obtain single compliance or success scores for each of the 50 permit files, we sought an objective means of "averaging" the scores from affiliated mitigation sites together. To do this, we weighted an individual mitigation site's score by the proportion of total permit file area that that mitigation site's area represented. More specifically, we calculated a single score by multiplying the compliance and function scores for individual mitigation sites by the proportion of the total mitigation acreage that each mitigation site comprised, then summing the proportional scores to yield a single score of success for that permit file. While this convention represents an objective means of determining single scores, it needs to be understood that some of these calculations were less than straightforward due to complexities in our acreage evaluation. While most sites had adequate information available to determine these acreage proportions (either from our GPS data or from the permit and/or mitigation plan documents), there were a few sites with undeterminable boundaries and poor documentation where we had to estimate the approximate acreage proportions that each mitigation site represented. A full description of these complexities is included in the methods section.

For most of the results summaries presented in this section, we focus on the three principle aspects of the study: the acreage evaluations, the compliance evaluations, and the UCLA-CRAM evaluations of function. This summary consists largely of a series of tables and figures that combine the acreage compliance, permit compliance, and functional evaluation elements of the project together, both by permit file and by individual mitigation site to address the question of success. We also provide "ranking" tables that show the order of sites with respect to their compliance and function scores. Also included are acreage tables that show the overall compliance information as acreage lost versus gained by permit file, and with acreage data organized by project type and permittee type. Our supplemental assessments comprise the rest of the section. Included here is a synthesis of these results, plus a series of figures and tables that show the breakdown of habitat types created in mitigation projects compared to what was lost at the corresponding impact sites, and the proportions of these habitat types found at the mitigation sites.

A master summary of study's primary results for all permit files is presented in Table 19. In this table, we present the acreage measured as a percentage of the acres required for mitigation, 401 permit compliance, mitigation plan compliance, and overall functional evaluation score by file. Included in this table are the 15 sites for which even approximate boundaries could not be determined and for which acreage data from other sources was not available. The compliance criteria specified in the mitigation plan serve as a proxy for the requirements of all relevant agencies (as set forth in the 404, 1600, and 401 permits) involved in the greater Section 404 permit process. In addition to the 50 Section 401 permit files for which a full Phase II functional assessment was made, there were five extra permit files for which a 401 permit compliance evaluation was possible, but an assessment of function was not. For these five permit files, compensatory mitigation consisted entirely of in-lieu fee payments that could not be tracked to discrete creation, restoration, enhancement, or preservation sites. These funds went into a "general fund" that, pooled with other sources of money, went toward multiple projects with no direct revenue-to-project tracking. There were other permit files that involved in-lieu fee payments that could be tracked to specific projects, and these projects were included in our Phase II assessments. However, even with these permits the in-lieu fees were pooled with other sources of money into "general funds" and there is no guarantee that some portion of the funds did not go to pay for administrative or other costs. Additionally, several of our 50 permit files involved in-lieu fee or mitigation bank payments that went to common mitigation, restoration, or enhancement projects. Hence both the compliance and functional evaluation data from several project sites are shared by multiple permit files. A master summary of the Phase I and Phase II data with results displayed for each of the 79 individual mitigation site evaluations is shown in Table 20. This table does not repeat any of the acreage data, as these data are only relevant to a "by file" summary.

In order to display our 50 fully assessed permit files by their compliance or functional success ranking, we rank the 50 permit files by their overall 401 permit compliance score (Table 21), their overall mitigation plan compliance score (Table 22), and their overall UCLA-CRAM functional success score (Table 23).

Frequency distributions showing all the compliance and functional success scores by permit file are given in Figure 76. As can be seen in Figure 76A and Figure 76B, over half the permits met 100% of the assessable 401 and mitigation plan conditions (56% and

58%, respectively). The permit compliance results must be evaluated with the understanding that some subset of conditions often could not be determined because of the age of the site or the nature of the condition. For example, it is not be possible to determine if mulching or removal of exotic plants was performed on a site that is 12 years old, or if 75% cover of native species occurred at year five. Information from mitigation reports might have been useful in assessing these conditions for compliance, but these reports were rarely available. Thus, our compliance evaluations were restricted to those conditions that could be assessed through our office or field surveys. It should also be noted that the standard and special conditions that could be assessed were typically management actions, rather than performance standards. It is unclear whether the failure to meet these conditions would necessarily result in a failure to meet the appropriate performance standards.

In comparison to the compliance results, functional success scores were much lower, with only a single permit file achieving a functional success score over 80% (Figure 76C). The results in Figure 76C show that these mitigation sites exhibit a wide range of function with a single mode centered around 50-60% (Mean = 57.8%).

To evaluate success or failure with respect to permit compliance and function, we considered both the criteria used in Sudol (1996) and the natural divisions present in our methods and data. In his evaluation of permit compliance and functional success of Section 404 permits, Sudol (1996) used the following criteria: For permit compliance, success was meeting 100% of the special conditions, failure was meeting 0%, and partial success was anything in between. For function, success was achieving a functional success score greater than 80% (based on the lowest functional capacity score found at the reference sites), failure was below 50%, and partial success was a score between 50% and 80%. For permit compliance, we adopted Sudol's convention exactly, but for functional success we used the numerical divisions between the lowest optimal score and the highest sub-optimal score for success (79.2% on the linear 1-12 scale) and between the lowest sub-optimal score and the highest marginal score for failure (54.2% on the linear 1-12 scale), as these were roughly equivalent to the 80% and 50% breaks respectively from Sudol (1996). In addition, we considered success in satisfying the acreage requirement to be meeting or exceeding the acreage required in the 401 permit, and failure to be anything below that amount. There was one site (92-04) with an insignificantly small acreage deficiency (0.003 acres below the 4.2 acre requirement) that we still considered successful.

Using these criteria for success, partial success, and failure, a summary of mitigation success by permit file is shown in Table 24, and the same analysis by individual mitigation site is shown in Table 25. Forty-six percent of permit files met or exceeded their acreage requirement and 60% successfully complied with their permit conditions. Among the files that had assessable permit conditions, all files met at least one assessable permit condition (and thus were judged partially successful), although 12 files (24%) failed to meet their acreage requirement. These results for acreage success are complicated by the fact that at a large percentage of sites, acreage determinations were not possible, either because the approximate boundaries of the site could not be determined or because no evidence of mitigation activities could be found. Even though the success rates for acreage and compliance were not high, the success rate for function was extremely low: only one site was considered successful with respect to function (Table 24). Clearly, success in meeting permit conditions does not ensure mitigation site function. A majority of permits (30, or 60%) achieved partial success while 19 files (38%) were considered failures. The results of mitigation success by individual mitigation site roughly mirror those just described "by file," except that one mitigation site failed to meet any assessable permit conditions, and four mitigation sites did not meet any of the assessable conditions outlined in their mitigation plans (Table 25).

To facilitate a rapid survey of the mitigation success results, we asked the following compliance- and success-related questions for each of the permit files and individual mitigation sites: Was the acreage requirement met? Was compliance with 401 conditions met? Was compliance with mitigation plan conditions met? And, was function successful? The results of this compliance and success questionnaire are displayed by permit file in Table 26, and by individual mitigation site in Table 27. For this questionnaire, we sought to distinguish those sites with scores that were very close to our numerical cutoffs from those that were more solidly within the bounds of the success categories. For permit compliance, the answers to the compliance questionnaire were classified as: yes (100%), mostly (75-99%), partially (26-74%), barely (1-25%), and no (0%). For functional success (with additional categories within 5 percentage points of the numerical cutoffs) the answers to the compliance questionnaire were: yes ($\geq$79.2%), mostly (74.2-79.2%), partially (59.2-79.2%), barely (54.2-59.2%), no, but nearly (49.2-54.2%), and no (<49.2%). For some sites, these questions were either not relevant (NA) or could not be assessed (ND). Summaries of these compliance questionnaire results by permit file is given in Table 28, and by individual mitigation site in Table 29. The percentage of sites deemed successful with respect to permit compliance and functional success did not change with this higher level of resolution. Alternatively, these tables and figures highlight the percentages of sites that were very close to being successful and those that were very close to failing, as well as those failed sites that were close to being categorized as partially successful. This higher level of resolution shows that more files were almost successful in permit compliance (401 and mitigation plan) compared to the earlier analysis, but not for function (Table 28). Alternatively, eight of the files that failed for function could almost be considered as partially successful. This pattern improved somewhat for individual mitigation sites wherein four sites could be characterized as almost successful in function (Table 29).

As an additional way to look at these results, we created a table showing the relationships between permit files that met or failed to meet three success criteria: the acreage requirement, the 401 permit compliance requirement, and the UCLA-CRAM functional evaluation (Table 30). This table suggests that compliance may not be the problem in meeting the "no net loss" goal. Sites that complied were no more likely to have functional success than sites that did not comply. To further investigate whether or not any relationship exists between permit compliance and mitigation site function, we performed a correlation analysis between these two variables, for both 401 permit compliance (Figure 77) and mitigation plan compliance (Figure 78). No relationships were found through these analyses. In addition, the distributions of 401 compliance and UCLA-CRAM scores were significantly different (Kolmogorov-Smirnov, p<0.001)

Given that 30% of the permits (15 out of 50 files) had undeterminable project boundaries and the complexity added by our potential acreage overestimates, analyses of mitigation success by acreage become difficult at best. In a study of compensatory mitigation projects associated with Section 404 permits issued prior to 1994, Sudol (1996) provided valuable statistics of acreage lost versus gained by permit type (individual, nationwide, etc.), project type (transportation related, residential, etc.), habitat type (wetlands, waters), and mitigation type (creation, restoration, etc.). Along with these statistics, he provided acreage tallies for all sites he assessed that were at least partially successful with respect to permit compliance and a qualitative functional evaluation. In our review of 401 permits issued between 1991 and 2002, complexities in the accounting between impacts and mitigation made it difficult to analyze our acreage data in a way comparable to Sudol (1996). For example, prior to permit issuance, the habitat type to be impacted is delineated and acreage estimates for each of the habitats are generated. As mitigation projects are planned, there is no consistent explicit connection between the types of mitigation habitat proposed and what was impacted, resulting in a potential shift between habitats lost and habitats gained. More importantly, mitigation projects are not designed to enable a clear distinction between the habitat types that are combined within a single mitigation site. Obscured by the transitional nature of wetlands, riparian areas, and the surrounding upland areas, mitigation sites typically consist of a mixture of transitional habitats interspersed together such that it impossible to separate them into discrete units for independent acreage determinations and functional evaluations. Likewise, all combinations of creation, restoration, enhancement, and preservation areas may be found within typical mitigation projects, making it difficult or impossible to make independent acreage or function assessments. The inclusion of preservation areas as compensatory mitigation creates a host of complications in the evaluation of loss versus gain of wetland acreage as well as wetland functions and services.

Given the above complications, we were unable to reproduce Sudol's (1996) acreage analyses for habitat type and mitigation type. However, we were able to do acreage analyses for project type and permittee type. The results of this analysis using the project type categories specified in the 401 permit files are shown in Table 31. One striking feature of this table is the disparity in mitigation ratios among project types and the reversed ratio found for flood control/drainage and pipeline/utility projects, where losses exceed permitted gains. Interestingly, the losses for flood control/drainage projects are compounded by further losses if both permit compliance and function evaluations are considered. Bridge crossing projects experienced poor success in acreage replacement for both compliance and function. Conversely, a large increase in mitigation acreage compared to the acreage lost was found for residential projects, but much of this increase is due to the inclusion of preservation areas in these acreage-gained figures. With respect to function, 84.59 acres were at least partially successful, which represents a 1.79:1 mitigation ratio of partial functional replacement for residential projects. Restoration projects were exceptional in creating a substantial increase in partial function acreage compared to acres lost and required. Many of these categorical acreage figures are disproportionately influenced by certain sites.

The acreage analysis for permittee type is shown in Table 32. As with the previous tables, there was a notable disparity in mitigation ratios among permittee types, with a reversed ratio found here for municipal permittees. And consistent with the project type analysis above, the losses due to this reversed ratio are compounded by further losses if both permit compliance and function evaluations are considered. Many aspects of this analysis are directly comparable to the 'project type' analysis above given the correlation between permittee type and project type (developers mostly build residential projects and flood control projects are predominantly undertaken by municipal entities). However there is much overlap and ambiguity present in the permit files in how these permittee categories are assigned. As one example to illustrate this, some permittees identified as "private" could clearly have been considered "developer."

While we were unable to perform an acreage analysis by habitat type to demonstrate acres of habitat lost versus gained, other data show that a net loss of wetlands and waters has been replaced by a net gain in riparian areas and terrestrial habitats as well as in-lieu fee mitigation (Figure 79 for the full set of 250 permits reviewed and Figure 80 for our set of 50 fully assessed permit files). These figures show the number of instances of the various habitat types lost compared to the number expected to be gained from an analysis of the information in the permit files. These analyses show the mitigation habitat types proposed and subsequently approved, but may not reflect the actual habitat types present at mitigation sites. In the larger sample size, large discrepancies between impacted and mitigation habitats occurred for vegetated and unvegetated streambeds, with more impacted than mitigated, and riparian and terrestrial, with more mitigated than impacted. (There were also more "other wetland" habitats impacted than mitigated, but this difference is likely due to mitigation plans naming specific wetland types.) Thus, it appears that streambed habitats are not being replaced as often as they are impacted, while habitat outside of the streambed (riparian and terrestrial) are included as mitigation more often than they are being impacted. This will lead to a shift in the distribution of wetland types in the landscape, such as reported by Gwin et al. (1999) for Oregon.

A recent Government Accountability Office report on wetland protection discussed the need to perform assessments to evaluate the effectiveness of in-lieu fee mitigation (USGAO 2001). This report found that nationwide, over 1440 acres of lost wetland habitat were compensated by in lieu fee payments exceeding $64.2 million, but with little accounting as to whether these payments adequately satisfied the "no net loss" goal. As can be seen in Figure 79, a substantial number of the permit files we reviewed employed in lieu fee payments as compensatory mitigation. Of 250 permit files, 16% involved in lieu fee payments. Complexities inherent in the in-lieu fee program, as currently implemented, have resulted in numerous problems with respect to both permit compliance and the assurance that the goal of "no net loss" will be met. Key weaknesses in the in-lieu fee process include problems with the timeliness of fee transfers, substantial delays in the implementation of mitigation projects by the in-lieu fee program administrator, transfer of money to an agency general fund rather than to a specific mitigation action, and use of in-lieu fee payments for projects that do not replace lost functions and services appropriately.

The concept of the in-lieu fee program is valid. In-lieu fee programs can take advantage of economies of scale and the consolidation of small mitigation requirements into a larger effort that is more likely to succeed. However, compliance cannot be assured without adequate oversight and accounting, and "no net loss" will not be achieved unless appropriate mitigation projects are undertaken. The most difficult problems with in-lieu fee programs stem from the absence of connection between the resources lost versus those gained from mitigation. Simple payment of fees facilitates the loss of this explicit link, exemplified by payments to a general program without any clear accounting for what the fees produced. In these situations, how can any particular fee be justified (rather than a smaller one)? An explicit link between losses and gains is fundamental to the proper application of mitigation policy; in-lieu fee programs must be implemented in a way that maintains this link. Most current in-lieu fee arrangements do not.

The results of our proportional habitat estimates for jurisdictional "waters of the United States" compared to non-waters habitat (beyond the federal jurisdictional boundaries) at both impact sites and mitigation sites are given in Figure 81. The data for impact sites were taken directly from the 401 permit files, which consider mostly losses within "waters of the United States." Impacts to 4.46 acres of non-jurisdictional waters are included in the permit for one file (#93-09). These data corroborate the results of our permit review analysis (Figure 79 and Figure 80) and show that of the jurisdictional habitats that are being mitigated, only about 50% of losses are being compensated for by creating restoring, or enhancing comparable jurisdictional wetland or waters habitat. The above results are displayed again in Figure 82, but with the data for "waters of the US" apportioned into wetland and non-wetland waters habitats, and the data for "non-waters" apportioned into riparian and upland habitats. From this figure it is clear that current mitigation policies are enabling a shift in habitat type, with losses to the "wetter" habitats, especially non-wetland waters, being replaced by drier riparian and upland areas that are outside the jurisdictional boundaries of future wetland protections. It should also be mentioned that while riparian areas may be an appropriate target habitat for wetland mitigation projects, many of the riparian mitigation projects we surveyed exist along the drier (or more upland-tending) end of the wetland to upland transitional riparian zone spectrum.

The results for wetland habitats are encouraging. It appears from Figure 82 that wetland losses are being adequately replaced by a greater amount of mitigated wetland habitat. The data for wetland acreage impacted and mitigated are given in Table 33. Within our 50 permit files, there were 62.42 acres of wetland lost and 94.41 acres gained (resulting in a mitigation ratio of 1.51:1). Several permit files with no wetland impacts created some wetland habitat at their mitigation sites. But as can be seen in Table 33, acreage gains were not evenly distributed among the permit files. Of the 25 files with wetland impacts, 12 files resulted in net acreage gains, while 13 files resulted in net acreage losses. On the other hand, where gains were achieved, they were usually substantial; net mitigation ratios among these files ranged from 1.61:1 to 29.62:1, with a mean ratio of 5.48:1. The acreage gained through these same files ranged from 0.20 to 6.66, with a mean of 3.18 acres. While these results offer a glimmer of hope for wetland replacement, there are two important caveats: (1) Our estimates of wetland mitigation acreage represent best-case scenarios. In estimating the proportion of wetland habitat present at the mitigation sites, we did not adhere strictly to the three-parameter wetland indicator criteria, as was done to determine wetland impacts. We considered a site fragment to be a wetland if the hydrology was appropriate and if we had a reasonable expectation that hydric soils and hydrophytic vegetation may develop there at some time in the future. These conditions may never develop, or they may take many years to develop, with consequent temporal loss of wetlands. (2) The success of ecological function at the site remains elusive. As discussed elsewhere in this report and in the literature, acreage is but one dimension for assessing mitigation and by itself does not guarantee no net loss of wetland functions and values; in fact, our results have shown that the condition of wetland mitigation sites was frequently low.

A master summary of functional assessment data is presented in Table 34. The data are reported as percentages of the points possible in all metrics except for the Average Services Gained-Lost data, which are the averages of units gained-lost in each of the seven services categories (Flood Storage, Flood Energy Dissipation, Groundwater Recharge, Biogeochemistry, Sediment Accumulation, Wildlife Habitat, and Aquatic Habitat).

6. Overall conclusions

Most mitigation projects met their permit conditions, or at least met the permit requirements we could assess. Nearly 2/3 of permit files achieved full compliance, having met 100% of their assessable conditions, or were mostly in compliance. About 75% of permit files were at least partially in compliance. The majority of these assessable permit conditions were management actions rather than performance standards. It is unclear whether the failure to meet these assessed conditions would necessarily result in a failure to meet the appropriate performance standards, or even if successfully meeting all permit conditions would guarantee the appropriate mitigation site function and an adequate replacement of the functions, values, and services lost at impact sites.

Despite the complications created by uncertain project boundary determinations, the vast majority of mitigation projects met their acreage requirements. However the acreage targets of mitigation plans factor in the increased jurisdiction of other regulatory agencies, making it easier to fulfill the Section 401 requirements. More importantly, the effective mitigation acreage may be inflated due to ambiguities inherent in the approved use of enhancement projects.

With respect to our main functional evaluations, which do not take into account the pre-mitigation conditions of the sites, less than 5% of mitigation sites were considered successful, as judged by having optimal wetland conditions, although about 70% were at least partially successful. It is common for mitigation sites to have moderate function, but not common for them to have high function. Moreover, this assessment of function focuses on current condition of the mitigation site, but does not consider the possibility of pre-existing function at the mitigation site; hence, all current "function" may not be attributable to the mitigation action.

Most mitigation sites scored relatively high for vegetation characteristics. This result suggests that the emphasis by mitigation planners and regulatory personnel is too heavily focused on the vegetation community and not enough on ensuring the appropriate hydrology for hydric soil development and for the establishment of obligate wetland plant communities.

While essentially all impacts regulated by Section 401 occurred within jurisdictional wetland and waters habitat, half of the approved mitigation acreage consisted of non-jurisdictional (non-waters) riparian and upland habitat. This result is complicated by the fact that the effectiveness of Section 401 cannot be fully evaluated without considering the entire Section 404 permit process. As part of the greater Section 404 process, some impacts to non-jurisdictional riparian habitats are factored into the mitigation plan due to the extended regulatory authority of the California Department of Fish and Game (CalDFG) under its Streambed Alteration Agreement. Still, this indicates that current mitigation policies are enabling a shift to occur with losses to the "wetter" habitats, especially non-wetland waters, being replaced by drier riparian and upland areas that are outside the jurisdictional boundaries of future wetland protection. This practice is supported by current regulatory guidelines that assume that an increased mitigation ratio can be used to achieve "no net loss" of wetland functions, values, and services. Jurisdictional wetlands themselves (as opposed to non-wetland jurisdictional habitat) appeared to have had a net gain in acreage through our 50 permit files. However, acreage gains were not evenly distributed among the permit files and over half of the files with wetlands impacts resulted in losses of wetland habitat. Our estimates of wetland habitat at mitigation sites represent the best-case scenario because we did not apply a strict three-parameter test, and the functions and services provided by these wetland habitats remains low.

Our qualitative estimates of loss/gain indicate that on average, only about 1/3 of the functions and services lost are compensated for by mitigation efforts. This figure would be lower if "non-waters" riparian habitats outside federal jurisdiction, but considered by CalDFG, were included in our loss estimates. Sediment accumulation, and flood storage had lower replacement success, than flood energy dissipation, biogeochemistry, and habitat services.

Our qualitative assessment of the permittee's overall success in meeting their permit obligations showed that about 50% of projects were successful and almost 90% were at least partial successful. However for our qualitative assessment of the appropriateness of approved mitigation activities, the situation was less favorable with about 30% success and 54% of projects at least partially successful. Taken together, these findings indicate that permittees are, for the most part, meeting their approved mitigation obligations, and that functional deficiencies and the failure of these projects to meet the "no net loss" goal of the Clean Water Act are largely due to shortcomings of the regulatory process itself.

The root of these shortcomings lies with a lack of explicit consideration of the full suite of functions, values, and services that will be lost through proposed impacts and might be gained through proposed mitigation sites and activities. This begins with the drafting of compensatory mitigation proposals by permittees that have little or no chance of meeting the "no net loss" goal. But ultimately it is manifested in the conditional approval of those mitigation measures by regulatory staff. There are certainly instances where inadequacies of subsequent mitigation plans, acreage shortfalls and other compliance issues contribute to net loss on an individual permit file basis. These problems frequently go unnoticed due to a lack of regulatory oversight and enforcement. However, our results demonstrate a much higher rate of success for compliance with permit conditions and acreage requirements than for replacement of lost wetland functions and services. Improving the protection of wetland resources will require a more careful scrutiny of mitigation plans to ensure they adequately replace lost habitat types, functions and services and the imposition of permit conditions that ensure that mitigation habitats provide appropriate functions and services.

7. Literature Cited

Allen, A.O. and J.J. Feddema. 1996. Wetland loss and substitution by the Section 404 permit program in southern California, USA. *Environmental Management* 20(2):263-274.

Ambrose, R.F. 2000. Wetland mitigation in the United States: assessing the success of mitigation policies. *Wetlands (Australia)* 19: 1-27.

Ambrose, R.F., S.F. Lee and S.P. Bergquist. 2003. Environmental Monitoring and Bioassessment of Coastal Watersheds in Ventura and Los Angeles Counties. Final Report to: Los Angeles Regional Water Quality Control Board.

Breaux, A. and F. Serefiddin. 1999. Validity of performance criteria and a tentative model for regulatory use in compensatory wetland mitigation permitting. *Environmental Management* 24(3):327-336.

Breaux, A. and M. Martindale. 2003. Wetland Ecological and Compliance Assessments in the San Francisco Bay Region, California. Draft Final Report to the San Francisco Bay Regional Water Quality Control Board, California State Water Resources Control Board, California Coastal Conservancy, and US Army Corps of Engineers, San Francisco District. July 31, 2003.

Brinson, M.M. 1993. A Hydrogeomorphic Classification for Wetlands. U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, MS, USA. Technical Report WRP-DE-4.

Brown, S.C. and P.L.M. Veneman. 2001. Effectiveness of compensatory wetland mitigation in Massachusetts, USA. *Wetlands* 21:508-518.

Collins, J.N., E.D. Stein, and M. Sutula. 2004. California Rapid Assessment Methods for Wetlands v2.0: User's Manual and Scoring Forms.

DeWeese, J. and C. Gould. 1994. An evaluation of selected wetland creation projects authorized through the Corps of Engineers Section 404 Program. US Department of the Interior, Fish and Wildlife Service, Sacramento Field Office, Sacramento, California, 90 pp.

Fennessy, M.S., A.D. Jacobs, and M.E. Kentula. 2004. Review of Rapid Methods for Assessing Wetland Condition. EPA/620/R-04/009. U.S. Environmental Protection Agency, Washington D.C.

Gibbons, J.W. 2003. Terrestrial habitat: a vital component for herpetofauna of isolated wetlands. *Wetlands* 23: 630-635.

Gilman, E.L. 1998. Nationwide permit program: unknown adverse impacts on the commonwealth of the Northern Mariana Islands' wetlands. *Coastal Management* 26:253-277.

Gwin S.E., Kentula M.E. & Shaffer P.W. (1999) Evaluating the effects of wetland regulation through hydrogeomorphic classification and landscape profiles. *Wetlands* 19, 477-489

Hawke, D.F. 1989. Everyday life in early America. HarperCollins, New York, USA.

Holland, C.C., and M.E. Kentula. 1992. Impacts of Section 404 permits requiring compensatory mitigation on wetlands in California. *Wetlands Ecology and Management* 2:157-69.

Kelly, N.M. 2001. Changes to the landscape patterns of coastal North Carolina wetlands under the Clean Water Act. *Landscape Ecology* 16:3-16.

Kentula, M.E., J.C. Sifneos, J.W. Good, M. Rylko, and K. Kunz. 1992. Trends and patterns in Section 404 permitting requiring compensatory mitigation in Oregon and Washington, USA. *Environmental Management* 16:109-19.

Knighton, D. 1998. Fluvial forms and processes: a new perspective. Oxford University Press, England.

Lazorchak, J.M. and D.J. Klemm. 1997. EMAP Surface Waters: Field Operations and Methods for Measuring the Ecological Condition of Wadeable Streams. EPA/620/R-94/004, Office of Research Development, U.S. Environmental Protection Agency, Cincinnati.

Leibowitz, S.G. 2003. Isolated wetlands and their functions: an ecological perspective. *Wetlands* 23: 517-531.

Los Angeles Regional Water Quality Control Board [LARWQCB]. California Environmental Protection Agency. http://www.swrcb.ca.gov/~rwqcb4/

Lyons, J., S.W. Trimble, and L.K. Paine. 2000. Grass versus trees: managing riparian areas to benefit streams of central North America. *Journal of the American Water Resources Association* 36: 919-930.

Mack, J.J. 2001. Ohio Rapid Assessment Method for Wetlands v5.0: User's Manual and Forms. Ohio EPA Technical Report WET/2001-1. Ohio Environmental Protection Agency Division of Surface Water, 401/Wetland Ecology Unit, Columbus, OH.

Miller, J. 1995. Man-made wetlands' future starts to dry up. *Los Angeles Times*, East Ventura County Edition, 9 July 1995, p. B1.

Miller, R.E., Jr. and B.E. Gunsalus. 1997. Florida Wetland Rapid Assessment Procedure. Updated 2nd edition. Technical Publication REG-001. Natural Resource Management District, West Palm Beach, FL.

Mitsch, W.J. and R.F. Wilson. 1996. Improving the success of wetland creation and restoration with know-how, time, and self-design. *Ecological Applications* 6:77-83.

National Research Council [NRC]. 1995. Wetlands: characteristics and boundaries. National Research Committee on Mitigating Wetland Losses. National Research Committee on Characterization of Wetlands. National Academy Press, Washington DC, USA.

National Research Council [NRC]. 2001. Compensating for wetland losses under the Clean Water Act. National Research Committee on Mitigating Wetland Losses. National Academy Press, Washington DC, USA.

National Research Council [NRC]. 2002. Riparian areas: functions and strategies for management. National Research Committee on Riparian Zone Functioning and Strategies for Management. National Academy Press, Washington DC, USA.

Race, M.S. 1985. Critique of present wetlands mitigation policies in the United States based on an analysis of past restoration projects in San Francisco Bay. *Environmental Management* 9:71-82.

Race, M.S. and M.S. Fonseca. 1996. Fixing compensatory mitigation: what will it take? *Ecological Applications* 6:94-101.

Rundel, P.W. 2002. Preserving Biodiversity. Southern California Environmental Report Card 2002. UCLA Institute of the Environment, Los Angeles:4-13.

Sifneos, J.C., E.W. Cake, J.R., and M.E. Kentula. 1992a. Effects of Section 404 Permitting on Freshwater Wetlands in Louisiana, Alabama, and Mississippi. *Wetlands* 12(1):28-36.

Sifneos, Jean C., Mary E. Kentula, and Paul Price. 1992b. Impacts of Section 404 Permits Requiring Compensatory Mitigation of Freshwater Wetlands in Texas and Arkansas. *The Texas Journal of Science* 44(4):475-485.

Stein, E.D. and R.E. Ambrose. 1998. A Rapid Assessment Method for Use in a Regulatory Context. *Wetlands* 18:379-392.

Sudol, M.F. 1996. Success of Riparian Mitigation as Compensation for Impacts due to Permits Issued Through Section 404 of the Clean Water Act in Orange County, California. D.Env. Dissertation, University of California, Los Angeles.

Sudol, M.F., and R.F. Ambrose. 2002. The U.S. Clean Water Act and habitat replacement: evaluation of mitigation sites in Orange County, California, USA. *Environmental Management* 30: 727-734.

United States General Accountability Office [USGAO]. May 2001. Report to Congressional Requesters, Wetlands Protection, Assessments Needed to Determine Effectiveness of In-Lieu-Fee Mitigation. http://www.epa.gov/owow/wetlands/pdf/GAO.pdf

Zedler, J.B. 1996. Tidal wetland restoration: a scientific perspective and southern California focus. Report T-038. California Sea Grant College System, University of California, La Jolla, California.

Zentner, J. J. 1988. Wetland restoration success in coastal California. Increasing our wetland resource: Proceedings of a Conference. Eds. J. Zelazny, and J. S. Feierabend, Washington, D.C.: National Wildlife Federation. pp. 216-219.

8. Tables

Table 1. Permits issued by the LARWQCB between 1990 and, 2003 showing discrepancies between the Regional Boards file tracking database and the State Board's database. The data for the UCLA file search show the outcome of our manual search of the Regional Boards file archives. Time constraints prevented us from reviewing every permit storage box.

	Total # Applications	Total # Certifications	Total # Certifications Requiring Mitigation	% of Applications Certified	% of Applications Requiring Mitigation Certified
State Board Database	1262	459	293	36.4	63.8
Regional Board Database	1290	433	112	33.6	25.9
UCLA File Search	887	601	319	68.5	53.1
Total Applications = Certifications, denials, and waivers					
Total Certifications = All standard and conditional certifications, plus "no further action" letters.					

Table 2. Results of the UCLA file search showing the number of permit applications, certifications, and certifications requiring compensatory mitigation by year. No permits were found from 1990, and few of the 2003 permits had been archived.

Year	Total Applications	Total Certifications	Certifications Requiring Mitigation
1990	0	0	0
1991	9	8	6
1992	22	19	15
1993	167	31	26
1994	140	36	20
1995	83	83	28
1996	99	96	26
1997	75	47	24
1998	50	50	28
1999	45	45	26
2000	46	46	30
2001	71	71	45
2002	62	61	38
2003	8	8	7
Totals	**877**	**601**	**319**

Table 3. Acreage of Temporary and Permanent Impacts by Habitat Type as designated in the 401 permits for the fifty files evaluated fully (Phase II). Totals for impacts in each habitat type are presented in the bottom line of the table. The sums of Temporary and Permanent impacts across habitat type are shown in the column titled "Overall".

Impact Type	Estuary	Non-Distinguished Wetland	Riparian	Unspecified Waters	Unvegetated Streambed	Vegetated Streambed	Marsh Wetland	Overall
Permanent	0.90	56.99	13.30	13.78	1.79	14.85	-	101.61
Temporary	-	4.76	6.69	48.32	1.61	5.68	0.55	67.61
Total	0.90	61.75	19.99	62.10	3.40	20.53	0.55	169.22

Table 4. Overview of Files and Mitigation Sites evaluated for Compliance. Twenty files had multiple mitigation sites. Fifteen files did not have assessable 401 Permit Conditions. Forty files had Mitigation Plans among a total of sixty-six mitigation sites. Three of these sites did not have assessable Mitigation Plan Conditions, so 39 files were evaluated for Mitigation Plan Compliance.

	Files	Mitigation Sites
Permit Compliance with conditions specified	49	70
401 Permit Compliance with Modern Conditions	50	79
Mitigation Plan Compliance	38	63

Table 5. Files which were randomly selected, but could not evaluated for either compliance or function for a variety of reasons. The reasons for which they were not evaluated are included. Text in bold indicates permit files with potential mitigation shortcomings.

File #	Cert Date	Project Title	Permittee	Visit Date	Reason Not Assessed
92-03	12/10/1992	Castaic Lake Water Agency, Santa Clara River Project, Santa Clarita, Los Angeles County	Castaic Lake Water Agency	4/9/2004	Impact project ongoing
94-08	2/3/1994	Construction of the Cajon Pipeline, San Gabriel River and Rio Hondo, El Monte, Los Angeles County	Cajon Pipeline Company, Ltd.	5/5/2004	**Impact project undertaken; Mitigation sites not located**
96-07	8/8/1996	Ongoing Forest Lawn Memorial Park Grading Project, Unnamed Tributary to San Jose Creek, Covina Hills, Los Angeles County	Lawn Forest Memorial Park	5/5/2004	**Access denied**
96-142	8/29/1998	Copperhill Road Bridge Crossing, San Francisquito Creek, Los Angeles County (Corps' File 96-00345-CSC)	Pacific Bay Homes (FKA J.M. Development Co, Inc.	4/14/2004	Impact project ongoing
96-144	12/11/1996	Proposed 884.5 Acre Development Project for Residential, Commercial, and Open Space Areas, Santa Clara River Tributaries, South of Antelope Valley Freeway (SR14), Near Santa Clarita, Los Angeles County	Pardee Construction Company	4/9/2004	Impact project ongoing
97-184	12/19/1997	Proposed Haun Creek Drainage Maintenance Project, Haun Creek, East of Santa Paula, Ventura Co	California Department of Transportation District	4/7/2004	**Mitigation not yet decided upon; file not evaluated**
97-185	12/15/1997	Potrero Creek/Westlake Lake, Westlake Village, Ventura County	Westlake Management Association	3/15/2004	No evidence of mitigation being required; file not evaluated
98-134	1/8/1999	Proposed Repair of Rip Rap and Construction of Groin Project (Corps Project No 9950052-DJC), Ventura River, City of Ventura, Ventura County	U.S.A Petroleum Corporation	4/19/2004	Impact project not undertaken
99-141	11/1/2000	Modified Padova Padua Hills Project (Corps' Project No. 2000-00030-PJF), Chicken Canyon Creek (A Tributary to Thompson Creek), City of Claremont , Los Angeles County	Pomona College and Padova Padua Hills	3/19/2004	Impact project ongoing
00-035	9/26/2001	Proposed Westpoint at Mandalay Bay Project (Corps' Project No 2000-00465-TW), Reliant Energy Canal, Tributary to Channel Islands Harbor, City of Oxnard, Ventura County	LB/L Suncal Mandalay, LLC	4/20/2004	Impact project ongoing
00-060	9/29/2000	Proposed Lake Sherwood tract 4192 Project (Corps' Project No. 2000-003090-PMG), Carlisle Creek/Lake Sherwood, City of Thousand Oaks, Ventura County	Sherwood Development Co.	4/14/2004	Impact project ongoing
00-101	1/19/2001	Proposed Phase III Stevenson Ranch Development (Corps' Project No. 2002-01570-AOA), Unnamed Tributary to the Santa Clara River, Santa Clarita Area, Los Angeles County	Lennar Communities	3/19/2004	Mitigation construction not yet completed

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File #	Cert Date	Project Title	Permittee	Visit Date	Reason Not Assessed
00-122	10/17/2000	Proposed Calleguas Creek Sediment Removal Project (corps Project No 2000-01733-SDM), Calleguas Creek, Ventura County	Ventura County Flood Control District	4/1/2004	**Impact project completed; mitigation not undertaken**
00-129	1/22/2001	Proposed Interstate 5/Santa Clara River Bridge Replacement Project (Corps' Project No. 2000-01823-AOA), City of Santa Clarita, Los Angeles County	California Department of Transportation District	3/19/2004	Impact project ongoing
00-133	2/12/2001	Proposed State Route 90/Culver Blvd Fly-over Project (Corps' Project No. 2000-01624-PJF), Unnamed Tributary to Ballona Creek, Marina del Rey, Los Angeles County	California Department of Transportation District	4/27/2004	Impact project not undertaken
00-145	6/15/2001	Proposed Parker Ranch Project (Corps' Project Mp 2001-0-0017-SDM), Arroyo Simi and Unnamed Tributaries, City of Simi Valley, Ventura County	Essex Property Trust, Inc & Simi Starlight Ranch, LLC	4/14/2004	Impact project ongoing
01-057	11/26/2001	Proposed Moorpark Highlands Specific Plan No 2 Project (Corps' Project No 2001-00290-SDM), Arroyo Simi, City of Moorpark, Ventura County	Morrison-Fountainwood-Agoura	4/6/2004	Impact project ongoing
01-075	10/16/2001	Proposed Village at Newberry Park, North Campus Project (Corps' Project No 2000-01604-SDM), Arroyo Conejo, City of Thousand Oaks, Ventura County	Seventh Day Adventists (Mr Lee Caviness)	4/6/2004	Impact project ongoing
01-087	10/31/2001	Proposed Replacement of the Highway 101 Bridge over the Santa Clara River (Corps' Project No 2001-01327-SAD), Cities of Oxnard and San Buenaventura, Ventura County	California Department of Transportation District	4/6/2004	Impact project ongoing
01-091	10/4/2001	Proposed Restoration of Robles Diversion Dam Facilities Project (Corps' Project No 99-50050-SDM), Ventura River, City of Ojai, Ventura County	Casitas Municipal Water District	4/19/2004	Impact project ongoing
02-123	11/22/2002	Proposed Chantry Flats Rd Repair Project (Corps' Project No 2000-01353-PJF), Lannan Cyn, Tributary to Santa Anita Creek, City of Sierra Madre, Los Angeles County	City of Sierra Madre	3/19/2004	Impact project ongoing

Table 6. Files evaluated for permit compliance, but not for function. Mitigation for these five sites consisted of in-lieu fee payments that were made, but could not be tracked to specific mitigation sites.

File #	Cert Date	Project Title	Visit Date	Reason Not Assessed
97-152	7/17/1998	Proposed Royal-Madera Shopping Center Project (92-50626-LM), Isolated Wetlands, City of Simi Valley, Ventura County	Not visited; evaluated 4/29/2004	In-lieu fee payment for mitigation to the Coastal Conservancy for Calleguas Creek Watershed Restoration Project that has not yet been initiated
98-055	3/1/2002	Proposed Old Topanga Canyon Road, et al. Project (Corps' Project No. 2002-00276-AOA), Topanga Canyon Creek, Unincorporated Los Angeles County	4/27/2004	In-lieu fees to USFS for exotic plant removal anywhere such projects undertaken
99-071	8/5/1999	Proposed VTTM 4935 Project (Corps' Project No 199915619-JPL), Unnamed Drainages Tributary to Arroyo Conejo, City of Thousand Oaks, Ventura County	Not visited; evaluated 4/30/2004	In-lieu fees paid to Coastal Conservancy for Calleguas Creek Watershed Restoration Program that has not yet been initiated
02-018	5/10/2002	Proposed Verdugo Debris Basin Retaining Wall Project (Corps' Project No. 2002-00470-JBL), Verdugo Wash, City of Los Angeles, Los Angeles County	Not visited; evaluated 4/27/2004	In-lieu fees to USFS for exotic plant removal anywhere such projects undertaken
02-108	10/8/2002	Proposed Mint Cyn: Tract 46353 Project (Corps Project No 2002-01377-PJF), Mint Cyn Creek Tributary to the Santa Clara River, City of Santa Clara, Los Angeles County	5/3/2004	Money pooled into a US forest service fund so that specific sites of removal and acreage cannot be determined; all sites located along San Francisquito Creek.

Table 7. The full set of 50 permit files for which both compliance (Phase I), and functional (Phase II) evaluations were made. For sites that were visited more than once, the date given is when the main compliance and functional evaluations were performed.

File #	Certification Date	Project Title	Date Visited
91-02	10/7/1991	Ventura County, Conejo Creek Streambank Protection Project	4/1/2004
92-04	10/28/1992	42-Acre Residential Development Project, Raznick Realty Group, Tentative Tracts 3666-2 and 4754, Conejo Mountain Creek, City of Thousand Oaks, Ventura County	4/7/2004
92-10	10/30/1992	Tierra Rejada Sanitary Landfill Emergency Flood Protection, Arroyo Simi, City of Simi Valley, Ventura County	3/8/2004
92-11	5/1/1992	Replacement of Malibu Lagoon Bridge	4/2/2004
93-06	6/4/1993	Medea Creek Restoration Project (Case No. 92-SPR-011), Morrison Ranch, Agoura Hills, Los Angeles County	3/11/2004
93-09	11/18/1993	Sunshine Canyon Landfill, Southwest of Antelope Freeway (State Route 14) and Golden State Freeway (Interstate 5), Los Angeles County (FKA 91-06)	4/23/2004
93-15	3/24/1994	The Lusk Company, Ridgemoor Residential Development, San Jose Creek, Rowland Heights, Los Angeles County	3/25/2004
93-19	11/30/1993	Maguire Thomas Partners, Playa Vista Phase I Development Project (Ballona Wetlands and Tributaries, Ballona Flood Control Channel, Centinela Ditch, and Scattered Wetlands), Los Angeles County	4/2/2004
94-03	6/24/1994	Arroyo Simi, Ventura County, Repair of Embankments and Utility Lines	3/8/2004
94-09	3/9/1994	Southern Pacific Milling Company Excavation Mining, Boulder Creek, Santa Clara River, Ventura County	4/8/2004
95-003	7/12/1995	Proposed Diamond Ranch High School Construction, Tributaries to Santa Ana River, Chino Basin, South of SR-60 (Pomona Fwy) and West of Chino Hills Parkway, Diamond Bar, Los Angeles County	4/27/2004
95-02	12/15/1995	Proposed Development of the Oak Park Zone III Residential Community, North of City of Agoura Hills, Ventura County	4/21/2004
95-04	12/8/1995	Proposed Tick Canyon Bridge Project (No 53-1547 R/L; Rile: 07-LA-14, PM 33.4/43.3), Median Widening, Route 14, Santa Clarita Valley, Los Angeles County	4/9/2004
95-062	8/11/1995	Proposed Bank Stabilization and Stream Diversion (7-VEN-150, 462811), Casitas Creek Slide, Route 150, 1.6 Miles from Ventura-Santa Barbara County Line, Ventura County	4/19/2004
95-07	7/31/1995	Proposed Walnut Creek Bridge Widening Project (07-LA-605; 119940) on Route 605, South of Route 10, West Covina, Los Angeles County	3/25/2004
95-08	7/11/1995	Dos Vientos Development Project, Courtly Homes, Tributaries to South Branch-Arroyo Conejo, Thousand Oaks, Ventura County	4/6/2004
95-091	11/30/1995	Proposed Borchard Road/Route 101 Freeway Interchange Improvement Project, South Branch Arroyo Conejo, Tributary to Calleguas Creek, Newbury Park, Thousand Oaks, Ventura County	4/13/2004
95-119	11/1/1996	Proposed Tract No. 3467 Residential Development and Bridge Crossing Project, Royal Oak Partners, South of Simi Valley Freeway (118) and West of Tapo Road, Runkle Creek and Arroyo Simi, Simi Valley, Ventura County	4/14/2004
96-086	7/10/1996	Proposed Santa Clara River Trail Phase III, Santa Clara River/Santa Clara River - South Fork, City of Santa Clarita, Los Angeles County	4/20/2004

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File #	Certification Date	Project Title	Date Visited
96-102	9/19/1996	Proposed Mugu Neighborhood Parks Project, Naval Air Weapons Station, Point Mugu, Ventura County	4/14/2004
97-080	7/13/1998	Proposed Mount Sinai Memorial Park Project (95-50256-BAH), White Oak Creek and Tributaries, City of Simi Valley, Ventura County	4/8/2004
97-088	10/28/1997	Proposed Toland Road Landfill Expansion Project, Unnamed Tributary to O'Leary Creek, Cities of Santa Paula and Fillmore, Ventura County	4/28/2004
97-103	3/19/1998	Proposed Desilting Basin Outlet Construction, Calleguas Creek, City of Camarillo, Ventura County	3/18/2004
97-129	12/17/1997	Expansion of Santa Fe Reservoir Spreading Grounds (Corps' File Nos OPN-95-02, 97-00379-MD)	4/28/2004
97-133	3/4/1998	Proposed Westport Homes (Tract T-4103) Development Project, Unnamed Tributary to Conejp Creek, City of Camarillo, Ventura County	4/1/2004
97-170	12/11/1997	Proposed Construction of Groins in the Santa Clara River, Del Valle, Los Angeles County	4/8/2004
97-175	7/24/1998	Valley Crest Tree Company (Corps' File No 98-50234-BAH)	4/21/2004
97-203	3/24/1998	Proposed Residential Development for Tentative Tract No. 46493, Unnamed Tributaries to Big Tujunga Wash, Sunland-Tujunga Area, Los Angeles County	5/6/2004
98-015	6/19/1998	Wastewater Conveyance Improvements, City of Thousand Oaks	4/9/2004
98-018	9/30/1998	John Laing Homes (Stevenson Ranch Phase IV), Pico Canyon Creek and Unnamed Tributaries to Dewitt Canyon Creek, City of Santa Clarita, Los Angeles County	4/6/2004
98-032	7/20/1998	Rancho Del-Tio Development	5/12/2004
98-072	11/5/1998	Proposed Malibu Terrace Project, Unnamed Tributaries to Las Virgenes Creek, Northwest of Calabasas, Los Angeles County	3/15/2004
98-112	10/20/1998	Proposed Lake Eleanor Hills Residential Development Project (Tract 47962), Unnamed Tributary to Lake Eleanor, City of Westlake Village, Los Angeles County	4/29/2004
98-196	3/22/1999	Proposed Parking and Road Extension for Community Support and Recreation Area (Corps' Project No. 9850362-LM), Unnamed Water, Point Mugu, Ventura County	4/14/2004
99-006	3/4/1999	Sinaloa Lake Phase II Project, An Aritifical Lake Tributary to Arroyo Simi, Simi Valley, Ventura County (Corps' File No 985047900-JPL)	5/4/2004
99-026	5/19/1999	Avenue Scott Bridge Construction Project, San Francisquito Creek, City of Santa Clarita, Los Angeles County	4/19/2004
99-037	7/28/1999	Casitas Dam Seismic Retrofit Project, Lake Casitas and Coyote Creek, Ventura County. (USACE File No 985032400-LM)	4/14/2004
99-045	5/18/1999	Proposed Arroyo Simi Channel Replacement Project (Corps' Project No. 99-0006700-JPL), City of Simi Valley, Ventura County	5/4/2004
99-054	7/21/1999	Golden Valley Road Extension Project, Oro Fino Creek, City of Santa Clarita, Los Angeles County	5/6/2004
99-055	6/15/2001	Proposed Hill Canyon Treatment Plant Phase II Flood Control Improvements Project (Corps' Project No 2001-00018-SDM), North Fork Arroyo Conejo, City of Thousand Oaks, Ventura County	5/5/2004

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File #	Certification Date	Project Title	Date Visited
99-100	8/28/1999	Proposed Telegraph Road Drain Project (Corps' Project No 98-00170-PMG), Unnamed Tributary to Sorenson Avenue Drain, City of Whittier, Los Angeles County	3/19/2004
00-112	10/17/2000	Proposed Route 30 San Antonio Channel Box Culvert Project (Corps' Project No. 2000-01778-PJF), San Antonio Creek, City of Claremont, Los Angeles County	3/19/2004
00-127	10/9/2001	Proposed Auto Hobby Shop Project (Corps' Project No 2000-01775-SDM), Unnamed Wetland Adjacent to Oxnard Drainage Ditch #2, Tributary to Mugu Lagoon, Ventura County	4/20/2004
00-160	2/5/2001	Proposed V.T.T.M. 45645- Hasley Canyon Project (Corps' Project No. 2001-00315-AOA), Unnamed Drainages Tributary to Castaic Creek, Val verde Area, Los Angeles County	4/8/2004
00-166	4/13/2001	"After the Fact" Proposed Las Posas Basin Aquifer Storage and Recovery Program (Corps' Project No 2001-00402-SDM), Grimes Canyon Creek, Tributary to Arroyo Simi, City of Moorpark, Ventura County	4/8/2004
00-168	3/8/2001	Proposed Camarillo II Project - Tract 5191 (Corps' Project No 1999-15577-PMG), City of Camarillo, Ventura County	3/8/2004
01-017	6/20/2001	Proposed Fish Creek Restoration Project (Corps' Project No 2001-00723-AOA), Near the City of Azusa, Los Angeles County	4/6/2004
01-020	7/13/2001	Proposed Stonecrest Replacement Sewer Pipeline Project (Corps' Project No 2001-00677-AOA), Santa Clara River, City of Santa Clarita, Los Angeles County	4/23/2004
01-135	11/6/2002	Proposed Encasement of the Ojai Valley Main at San Antonio Creek Project (Corps' Project No 2001-01401-JWM), San Antonio Creek and Ventura River, City of Ojai, Ventura County	4/13/2004
02-109	11/1/2002	Proposed Aircraft Parking Apron, Point Mugu Site, Milcon P-267 Porject (Corps' Project No. 2002-01100-MDC), Drainage to Mugu Lagoon, City of Point Mugu, Ventura County	4/20/2004

Table 8. Permit Compliance, Permit Compliance (Modern Conditions), and Mitigation Plan Compliance data by file and mitigation site number for all 55 files among 84 mitigation sites that were evaluated for compliance. For some sites, there were conditions specified, but none of them could be determined in the field; compliance was not calculated for these sites. Dashes indicate sites where either there were not conditions for assessment or there were not any assessable conditions such that Compliance could not be calculated.

Permit File Number	Mitigation Site Number	401 Permit Compliance (Specified in Permit)			401 Permit Compliance (Modern Conditions)			Mitigation Plan Compliance		
		# of File Conditions for Assessment	# of Conditions Met	Compliance	# of File Conditions for Assessment	# of Conditions Met	Compliance	# of File Conditions for Assessment	# of Conditions Met	Compliance
91-02	1	3	2	67	5	3	60	2	1	50
92-04	1	1	1	100	6	6	100	4	4	100
92-10	1	2	1	50	5	2	40	1	1	100
92-11	1	4	4	100	7	7	100	4	4	100
93-06	1	1	1	100	7	7	100	5	5	100
93-09	1	2	2	100	7	6	86	2	2	100
93-09	2	2	2	100	7	7	100	2	2	100
93-15	1	0	-	-	5	5	100	9	9	100
93-15	4	0	-	-	6	4	67	12	12	100
93-15	3	0	-	-	6	5	83	9	4	44
93-15	2	0	-	-	6	5	83	0	-	-
93-19	1	3	3	100	8	8	100	8	8	100
94-03	1	3	1	33	5	2	40	-	-	-
94-03	2	2	1	50	5	2	40	-	-	-
94-09	1	3	3	100	5	3	60	-	-	-
95-003	1	3	3	100	8	6	75	3	3	100
95-02	1	2	2	100	8	7	88	8	7	88
95-02	2	2	2	100	8	6	75	5	2	40
95-04	1	6	5	83	7	6	86	2	2	100
95-062	1	1	1	100	7	6	86	6	5	83
95-07	1	8	3	38	6	1	17	3	1	33
95-08	1	4	4	100	5	5	100	4	4	100
95-08	2	4	4	100	6	6	100	3	3	100
95-08	3	4	4	100	6	6	100	3	3	100
95-08	4	4	4	100	6	6	100	3	3	100
95-091	1	4	4	100	7	4	57	7	6	86
95-091	2	4	4	100	7	4	57	7	7	100
95-119	1	3	3	100	7	5	71	-	-	-
95-119	2	3	0	0	8	2	25	-	-	-
95-119	3	4	4	100	8	8	100	-	-	-
96-086	1	6	3	50	8	5	63	3	1	33
96-086	2	6	3	50	7	3	43	3	2	67
96-086	3	5	2	40	7	2	29	1	0	0.0
96-102	1	5	4	80	8	6	75	-	-	-
97-080	1	2	1	50	7	5	71	4	4	100
97-088	1	4	3	75	8	7	88	12	11	92
97-088	2	4	4	100	8	8	100	10	10	100
97-103	1	1	1	100	8	6	75	13	12	92
97-103	2	1	1	100	8	6	75	13	13	100
97-129	1	5	4	80	7	6	86	5	5	100
97-129	3	4	1	25	5	2	40	2	0	0
97-133	1	0	-	-	8	6	75	0	-	-
97-133	2	0	-	-	8	6	75	0	-	-
97-152	1	1	1	100	-	-	-	-	-	-
97-170	1	3	3	100	7	6	86	3	3	100
97-175	1	1	1	100	6	3	50	3	3	100
97-203	1	0	-	-	8	5	63	14	9	64
97-203	2	0	-	-	8	4	50	14	9	64
98-015	1	0	-	-	7	6	86	4	4	100
98-015	2	0	-	-	7	5	71	4	4	100
98-015	3	0	-	-	7	6	86	4	4	100
98-018	1	3	3	100	7	6	86	10	9	90

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Permit File Number	Mitigation Site Number	401 Permit Compliance (Specified in Permit)			401 Permit Compliance (Modern Conditions)			Mitigation Plan Compliance		
		# of File Conditions for Assessment	# of Conditions Met	Compliance	# of File Conditions for Assessment	# of Conditions Met	Compliance	# of File Conditions for Assessment	# of Conditions Met	Compliance
98-032	1	4	4	100	7	7	100	8	8	100
98-032	2	4	4	100	7	7	100	8	8	100
98-055	1	1	1	100	-	-	-	-	-	-
98-072	1	2	1	50	8	4	50	11	5	45
98-112	1	1	1	100	6	5	83	1	1	100
98-112	2	1	1	100	6	5	83	1	1	100
98-112	3	1	1	100	6	6	100	1	1	100
98-196	1	1	1	100	8	7	88	-	-	-
99-006	1	4	4	100	8	7	88	5	5	100
99-026	1	6	4	67	8	5	63	2	2	100
99-026	2	6	4	67	8	5	63	2	2	100
99-026	3	4	1	25	6	1	17	2	0	0
99-037	1	0	-	-	8	6	75	10	10	100
99-037	2	0	-	-	7	6	86	9	9	100
99-045	1	2	1	50	6	3	50	-	-	-
99-054	1	3	3	100	7	6	86	8	7	88
99-055	1	4	4	100	8	8	100	9	9	100
99-055	2	4	4	100	8	7	88	9	9	100
99-071	1	1	1	100	-	-	-	-	-	-
99-100	1	1	1	100	7	4	57	-	-	-
00-112	1	1	1	100	5	5	100	-	-	-
00-127	1	1	1	100	7	6	86	-	-	-
00-160	1	8	7	88	8	7	88	9	8	89
00-166	1	7	7	100	6	6	100	9	9	100
00-166	2	7	5	71	6	4	67	7	7	100
00-168	1	0	-	-	7	5	71	14	14	100
01-017	1	6	6	100	7	7	100	11	11	100
01-020	1	3	3	100	6	5	83	1	1	100
01-135	1	2	2	100	7	5	71	5	3	60
02-018	1	1	1	100	-	-	-	-	-	-
02-108	1	1	1	100	-	-	-	-	-	-
02-109	1	3	3	100	7	6	86	-	-	-

Table 9. Number of specified 401 permit conditions that were assessable compared the number not assessable for each of the 55 files assessed for permit compliance.

File #	Mitigation Site #	Assessable Permit Conditions	Not Assessable Permit Conditions	Total Conditions Specified
91-02	1	3	3	6
92-04	1	1	0	1
92-10	1	2	2	4
92-11	1	4	0	4
93-06	1	1	1	2
93-09	1	2	2	4
93-09	2	2	2	4
93-15	1	0	0	0
93-15	2	0	0	0
93-15	3	0	0	0
93-15	4	0	0	0
93-19	1	3	3	6
94-03	1	3	0	3
94-03	2	2	1	3
94-09	1	3	1	4
95-003	1	3	0	3
95-02	1	2	0	2
95-02	2	2	0	2
95-04	1	6	3	9
95-062	1	1	0	1
95-07	1	8	4	12
95-08	1	4	0	4
95-08	2	4	0	4
95-08	3	4	0	4
95-08	4	4	0	4
95-091	1	4	0	4
95-091	2	4	0	4
95-119	1	3	0	3
95-119	2	3	0	3
95-119	3	4	0	4
96-086	1	6	0	6
96-086	2	6	0	6
96-086	3	5	1	6
96-102	1	5	1	6
97-080	1	2	5	7
97-088	1	4	2	6
97-088	2	4	2	6
97-103	1	1	0	1
97-103	2	1	0	1

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97-129	1	5	0	5
97-129	3	4	0	4
97-133	1	0	0	0
97-133	2	0	0	0
97-152	1	2	0	2
97-170	1	3	1	4
97-175	1	1	0	1
97-203	1	0	0	0
97-203	2	0	0	0
98-015	1	0	0	0
98-015	2	0	0	0
98-015	3	0	0	0
98-018	1	3	0	3
98-032	1	4	0	4
98-032	2	4	0	4
98-055	1	1	0	1
98-072	1	2	0	2
98-112	1	1	4	5
98-112	2	1	4	5
98-112	3	1	4	5
98-196	1	1	0	1
99-006	1	4	0	4
99-026	1	6	0	6
99-026	2	6	0	6
99-026	3	4	0	4
99-037	1	0	0	0
99-037	2	0	0	0
99-045	1	2	1	3
99-054	1	3	0	3
99-055	1	4	0	4
99-055	2	4	0	4
99-071	1	1	0	1
99-100	1	1	0	1
00-112	1	1	0	1
00-127	1	1	0	1
00-160	1	8	1	9
00-166	1	7	1	8
00-166	2	7	1	8
00-168	1	0	0	0
01-017	1	6	0	6
01-020	1	3	1	4
01-135	1	2	1	3
02-018	1	1	0	1
02-108	1	1	0	1
02-109	1	3	0	3

Table 10. 401 Permit condition analysis including the percent of sites where these conditions were specified and met (% of sites in compliance) and the percent of sites where these conditions were specified, but there was not enough evidence to determine whether they were met (% of sites where compliance was undeterminable). This analysis involves the 70 sites among 49 files at which 401 Permit Compliance was evaluated.

401 Permit Conditions	% Met	% Not Met	% Undetermined
Mitigation has been maintained in perpetuity?	72	16	12
Grading to pre-project contours?	88	0	12
Exotic plants absent?	16	84	0
Evidence of exotic plant removal?	41	41	18
Minor impact of exotics on site?	78	22	0
Is native vegetation present?	94	6	0
Is there evidence of restorative planting?	73	18	9
Presence of species specified for revegetation?	100	0	0

Table 11. 401 Permit condition analysis (modern conditions) including the percent of sites where these conditions were specified and met (% of sites in compliance) and the percent of sites where these conditions were specified, but there was not enough evidence to determine whether they were met (% of sites where compliance was undeterminable (N=79 sites).

401 Permit Modern Conditions	% Met	% Not Met	% Undetermined
Mitigation has been maintained in perpetuity?	68.4	25.3	6.3
Grading to pre-project contours?	79.7	17.4	2.9
Exotic plants absent?	21.5	78.5	0.0
Evidence of exotic plant removal?	34.7	20.0	45.3
Minor impact of exotics on site?	79.7	20.3	0.0
Is native vegetation present?	96.2	3.8	0.0
Is there evidence of restorative planting?	84.6	5.1	10.3
Presence of species specified for revegetation?	100.0	0.0	0.0

Table 12. Section 401 permit condition analysis (mitigation plan) including the percent of sites where these conditions were specified and met (% of sites in compliance) and the percent of sites where these conditions were specified, but there was not enough evidence to determine whether they were met (% of sites where compliance was undeterminable (N=63 sites).

Mitigation Plan Conditions	% Met	% Not Met	% Undetermined
Oak restoration program	80.0	0.0	20.0
Grading of existing topography	90.5	4.8	4.8
Removal of exotics/weeds	41.9	20.9	37.2
Soil preparation	41.7	12.5	45.8
Debris removal	60.9	21.7	17.4
Hydroseed	39.1	0.0	60.9
Mulching	45.5	18.2	36.4
Erosion control	95.0	0.0	5.0
Revegetate with natives	91.5	5.1	3.4
Specified revegetation species present	89.7	7.7	2.6
Cutting and seeds local	6.9	0.0	93.1
Specified planting season	3.7	0.0	96.3
Created a planting schedule	4.2	0.0	95.8
Planting pattern, not rows	88.9	3.7	7.4
Preservation of natives in impact area	71.4	14.3	14.3
Replanting of dead materials as needed	30.4	13.0	56.5
Temporary irrigation (unspecified duration)	58.3	0.0	41.7
Temporary fertilization (unspecified duration)	0.0	0.0	100.0
Plants independent from irrigation for required years	27.3	0.0	72.7

Table 13. Summary of mitigation acreage data including lost vs. gained calculations and totals for all 50 fully assessed permit files. The five permit files with non-tractable in-lieu fee payments are not included here. Acres of preserves are not included in the Acres impacted. Acres of preservation are not included in the "Acres of Mitigation Required" presented here because we did not measure these sites in the field. Totals for the last two columns effectively remove the 15 "point" sites from the analysis. For data with asterisks, we make the assumption that those sites with undeterminable boundaries had met their acreage requirement exactly.

File #	Acres Impacted (Lost)	Acres of Mitigation Required	Required-Lost	Acres Measured (Gained)	Acreage Gained*	Gained – Lost*	Gained-Required	Gained-Lost
91-02	0.25	0.50	0.25	N.D.	0.50	0.25	N.D.	N.D.
92-04	0.90	4.20	3.30	4.20	4.20	3.30	0.00	0.00
92-10	10.82	12.50	1.68	N.D.	12.50	1.68	N.D.	N.D.
92-11	0.90	0.90	0.00	N.D.	0.90	0.00	N.D.	N.D.
93-06	1.10	1.10	0.00	8.65	8.65	7.55	7.55	7.55
93-09	7.61	26.42	18.81	43.63	43.63	36.02	17.21	36.02
93-15	2.90	8.20	5.30	10.25	10.25	7.35	2.05	7.35
93-19	28.08	51.10	23.02	30.89	30.89	2.81	-20.21	2.81
94-03	1.79	1.97	0.18	N.D.	1.97	0.18	N.D.	N.D.
94-09	5.90	0.00	-5.90	N.D.	0.00	-5.90	N.D.	N.D.
95-003	1.10	2.00	0.90	2.58	2.58	1.48	0.58	1.48
95-02	0.86	0.00	-0.86	0.05	0.05	-0.81	0.05	-0.81
95-04	0.33	1.16	0.83	0.66	0.66	0.33	-0.50	0.33
95-062	1.03	4.90	3.87	1.48	1.48	0.45	-3.42	0.45
95-07	2.38	2.38	0.00	N.D.	2.38	0.00	N.D.	N.D.
95-08	5.72	9.24	3.52	20.81	20.81	15.09	11.57	15.09
95-091	0.95	4.42	3.47	6.04	6.04	5.09	1.62	5.09
95-119	1.19	1.34	0.15	0.73	0.73	-0.46	-0.61	-0.46
96-086	2.40	2.90	0.50	1.36	1.36	-1.04	-1.54	-1.04
96-102	3.58	3.50	-0.08	10.00	10.00	6.42	6.50	6.42
97-080	0.36	6.00	5.64	7.90	7.90	7.54	1.90	7.54
97-088	0.59	1.19	0.60	2.32	2.32	1.73	1.13	1.73
97-103	0.16	0.46	0.30	N.D.	0.46	0.30	N.D.	N.D.
97-129	50.00	4.45	-45.55	4.25	4.25	-45.75	-0.20	-45.75
97-133	0.39	0.78	0.39	N.D.	0.78	0.39	N.D.	N.D.
97-170	0.82	0.04	-0.78	N.D.	0.04	-0.78	N.D.	N.D.
97-175	1.70	5.50	3.80	3.20	3.20	1.50	-2.30	1.50
97-203	0.75	2.25	1.50	0.70	0.70	-0.05	-1.55	-0.05
98-015	3.30	8.76	5.46	7.08	7.08	3.78	-1.68	3.78
98-018	2.15	4.50	2.35	5.19	5.19	3.04	0.69	3.04
98-032	0.64	0.64	0.00	1.49	1.49	0.85	0.85	0.85
98-072	0.47	1.00	0.53	0.36	0.36	-0.11	-0.64	-0.11
98-112	0.51	1.01	0.50	1.19	1.19	0.68	0.18	0.68
98-196	1.37	6.00	4.63	6.10	6.10	4.73	0.10	4.73
99-006	10.95	18.75	7.80	17.60	17.60	6.65	-1.15	6.65
99-026	2.90	2.90	0.00	N.D.	2.90	0.00	N.D.	N.D.
99-037	2.88	4.75	1.87	3.39	3.39	0.51	-1.36	0.51
99-045	2.00	2.00	0.00	N.D.	2.00	0.00	N.D.	N.D.
99-054	0.90	2.70	1.80	2.85	2.85	1.95	0.15	1.95
99-055	3.15	2.78	-0.37	6.79	6.79	3.64	4.01	3.64
99-100	0.08	0.02	-0.06	N.D.	0.02	-0.06	N.D.	N.D.
00-112	0.10	6.93	6.83	N.D.	6.93	6.83	N.D.	N.D.
00-127	0.97	3.00	2.03	N.D.	3.00	2.03	N.D.	N.D.
00-160	0.07	1.06	0.99	1.49	1.49	1.42	0.43	1.42
00-166	0.24	0.59	0.35	0.98	0.98	0.74	0.39	0.74
00-168	0.31	3.51	3.20	9.36	9.36	9.05	5.85	9.05
01-017	0.82	1.24	0.42	2.11	2.11	1.29	0.87	1.29
01-020	0.35	0.35	0.00	0.37	0.37	0.02	0.02	0.02
01-135	0.10	0.06	-0.04	0.07	0.07	-0.03	0.01	-0.03
02-109	0.41	1.24	0.83	N.D.	1.24	0.83	N.D.	N.D.
Totals	**169.23**	**233.19**	**63.96**	**226.12**	**261.74***	**92.51***	**28.55**	**83.46**

Table 14. CRAM data by individual mitigation site (79 individual mitigation projects within 50 permit files). CRAM data include Wetland Class, fourteen metrics grouped into four categories (Buffer, Hydrology, Abiotic Structure, and Biotic Structure), and Stressor data for each mitigation site.

			Buffer			Hydrology			Abiotic Structure			Biotic Structure					Stressors (Low # = Low Stress)			
File #	Mitigation Site #	Wetland Class	% of AA w/ Buffer	Ave Buffer Width	Buffer Condition	Source of Water	Hydroperiod	Upland Connection	Abiotic Patch Richness	Topographic Complexity	Sediment Integrity	Organic Matter Accumulation	Biotic Patch Richness	Vertical Structure	Interspersion/Zonation	Plant Community Integrity	Hydrology	Abiotic Structure	Biotic Structure	Adjacent Land Use
91-02	1	Riverine	B	B	B	B	A	B	A	B	B	B	B	C	C	B	19	20	2	13
92-04	1	Riverine	D	A	A	B	B	B	B	B	A	A	B	B	A	A	20	33	2	11
92-10	1	Riverine	B	A	C	B	D	B	A	A	B	B	B	B	A	C	29	44	4	15
92-11	1	Estuarine	A	A	B	B	B	B	B	B	A	A	C	B	B	A	20	33	28	17
93-06	1	Riverine	D	B	A	C	B	B	A	A	A	A	B	A	A	A	14	35	2	8
93-09	1	Riverine	B	C	B	B	D	B	D	C	B	B	C	B	C	A	19	23	12	11
93-09	2	Riverine	A	A	B	C	A	A	A	B	A	A	B	A	A	A	38	34	10	11
93-15	1	Riverine	B	D	B	C	D	C	B	A	B	A	B	B	B	A	34	18	4	12
93-15	2	Riverine	B	A	B	C	D	C	D	C	D	D	D	D	D	D	12	18	4	12
93-15	3	Riverine	C	A	A	A	A	A	C	A	A	A	C	B	B	A	2	4	1	6
93-15	4	Riverine	D	A	A	C	C	C	D	C	D	C	D	C	C	A	17	23	4	6
93-19	1	Riverine	A	B	B	C	B	A	B	A	B	B	B	C	B	A	35	33	5	12
94-03	1	Riverine	D	D	D	B	D	D	C	B	D	D	D	D	D	A	54	41	3	11
94-03	2	Riverine	B	A	C	B	D	B	B	A	B	B	B	C	B	C	39	43	4	11
94-09	1	Riverine	D	A	B	B	A	A	A	A	B	C	D	D	D	A	28	28	3	19
95-003	1	Riverine	C	A	A	B	B	B	D	B	C	B	C	D	C	B	23	44	3	8
95-02	1	Riverine	D	C	B	C	B	B	B	B	A	A	B	A	B	A	20	33	11	18
95-02	2	Spring and Seep	A	A	A	C	C	N.A.	D	C	B	C	C	C	C	A	2	6	3	6
95-04	1	Riverine	D	A	B	B	B	B	C	B	B	C	C	D	C	B	27	36	19	18
95-062	1	Riverine	B	A	A	B	B	B	C	B	C	C	C	B	A	A	22	24	3	8
95-07	1	Riverine	C	A	C	B	B	C	D	C	B	D	D	D	D	C	36	24	5	14
95-08	1	Riverine	C	B	B	B	C	B	A	A	A	A	B	B	B	A	48	46	6	8
95-08	2	Riverine	C	B	A	B	B	B	C	B	B	B	B	C	A	A	32	46	6	8
95-08	3	Riverine	A	A	B	C	B	A	C	B	B	A	C	C	C	A	14	29	1	8
95-08	4	Riverine	A	A	A	C	B	A	C	B	B	A	C	B	C	A	14	29	1	8

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File #	Mitigation Site #	Wetland Class	Buffer			Hydrology			Abiotic Structure			Biotic Structure					Stressors (Low # = Low Stress)			
			% of AA w/ Buffer	Ave Buffer Width	Buffer Condition	Source of Water	Hydroperiod	Upland Connection	Abiotic Patch Richness	Topographic Complexity	Sediment Integrity	Organic Matter Accumulation	Biotic Patch Richness	Vertical Structure	Interspersion/Zonation	Plant Community Integrity	Hydrology	Abiotic Structure	Biotic Structure	Adjacent Land Use
95-091	1	Riverine	A	D	C	C	D	B	D	C	D	D	D	D	D	C	36	39	1	17
95-091	2	Riverine	D	D	C	C	D	C	D	C	D	D	D	D	D	B	36	39	1	17
95-119	1	Riverine	D	D	N.A.	B	B	B	D	C	A	B	C	B	B	A	31	45	2	8
95-119	2	Riverine	D	D	N.A.	B	B	B	D	C	D	C	D	D	D	A	31	45	2	8
95-119	3	Riverine	A	B	A	B	B	A	B	B	B	C	D	D	D	A	9	33	3	9
96-086	1	Riverine	B	A	A	B	B	B	B	B	B	C	C	D	C	A	13	29	2	13
96-086	2	Riverine	B	A	B	B	B	B	B	B	B	B	C	D	C	C	21	36	16	13
96-086	3	Riverine	C	A	B	B	B	B	B	B	B	C	C	D	C	A	30	29	3	13
96-102	1	Estuarine	B	D	C	B	B	A	B	A	A	A	B	D	A	A	36	49	3	8
97-080	1	Riverine	B	A	A	B	B	A	B	B	A	B	C	D	A	A	28	26	5	8
97-088	1	Riverine	A	B	B	C	A	B	D	B	B	B	D	C	B	A	8	38	4	12
97-088	2	Riverine	A	A	A	A	A	A	D	A	B	B	D	B	B	A	8	38	4	12
97-103	1	Riverine	D	A	B	B	B	A	D	C	B	C	D	D	D	A	25	43	11	9
97-103	2	Riverine	D	A	B	B	B	B	C	B	B	B	C	C	D	C	24	43	25	11
97-129	1	Riverine	C	A	C	B	D	C	D	C	C	C	C	C	A	A	43	41	7	22
97-129	3	Riverine	B	B	D	D	D	B	D	C	D	D	D	D	D	D	43	41	7	22
97-133	1	Riverine	D	A	B	B	B	A	D	C	B	C	D	D	D	A	25	43	11	9
97-133	2	Riverine	D	A	B	B	B	B	C	B	B	B	C	C	D	C	24	43	25	11
97-170	1	Riverine	C	A	B	B	B	B	B	B	B	B	C	D	C	B	34	41	1	14
97-175	1	Riverine	B	A	B	C	B	A	D	C	B	C	C	C	D	C	10	34	8	8
97-203	1	Riverine	D	A	A	C	B	C	D	C	C	C	D	C	D	B	26	28	10	9
97-203	2	Riverine	A	C	C	C	B	C	D	C	C	C	D	C	D	B	27	33	6	8
98-015	1	Riverine	A	A	A	B	B	A	A	A	B	A	B	A	A	A	10	16	5	6
98-015	2	Riverine	A	A	A	B	B	B	A	A	B	A	B	B	A	A	13	16	5	6
98-015	3	Riverine	A	A	A	B	B	A	A	A	B	A	B	A	A	A	10	16	5	6
98-018	1	Riverine	B	A	A	B	B	B	B	B	B	B	C	C	B	A	23	41	3	8

Table Continues on next page…

			Buffer			Hydrology			Abiotic Structure			Biotic Structure					Stressors (Low # = Low Stress)			
File #	Mitigation Site #	Wetland Class	% of AA w/ Buffer	Ave Buffer Width	Buffer Condition	Source of Water	Hydroperiod	Upland Connection	Abiotic Patch Richness	Topographic Complexity	Sediment Integrity	Organic Matter Accumulation	Biotic Patch Richness	Vertical Structure	Interspersion/Zonation	Plant Community Integrity	Hydrology	Abiotic Structure	Biotic Structure	Adjacent Land Use
98-032	1	Riverine	D	D	C	C	B	B	D	C	A	B	C	D	C	A	20	38	3	15
98-032	2	Riverine	B	B	B	B	B	B	C	B	B	B	C	C	B	A	28	26	4	13
98-072	1	Riverine	A	B	B	B	B	A	C	C	B	C	D	C	D	C	15	21	3	9
98-112	1	Riverine	C	A	A	B	B	B	D	C	B	C	C	C	C	A	13	10	3	7
98-112	2	Riverine	D	D	A	C	C	B	C	B	B	B	D	C	B	A	10	11	5	8
98-112	3	Riverine	D	D	B	B	B	A	D	C	B	B	D	B	D	A	10	10	4	11
98-196	1	Estuarine	B	A	A	B	B	A	B	A	A	A	C	D	A	A	32	63	19	21
99-006	1	Lacustrine	A	C	B	B	B	N.A.	B	A	B	A	B	B	A	A	25	33	12	12
99-026	1	Riverine	B	B	A	B	B	B	A	A	B	A	C	B	D	A	23	28	10	12
99-026	2	Riverine	B	B	A	B	B	A	A	A	B	A	C	C	A	B	23	28	10	12
99-026	3	Riverine	B	B	B	B	B	C	A	A	B	A	C	A	D	B	23	28	10	12
99-037	1	Riverine	A	A	B	B	A	A	C	B	C	B	C	C	B	A	14	16	10	9
99-037	2	Riverine	B	A	A	B	A	A	B	B	B	A	C	A	B	A	3	16	11	9
99-045	1	Riverine	C	A	C	C	D	C	C	C	B	B	C	C	B	B	43	33	6	14
99-054	1	Riverine	B	A	B	B	B	B	C	B	C	C	D	C	C	A	22	24	6	14
99-055	1	Riverine	A	A	B	C	B	A	B	A	B	B	B	C	A	A	13	20	7	5
99-055	2	Riverine	A	A	B	B	B	C	C	B	C	C	C	C	D	A	19	24	3	5
99-100	1	Riverine	A	B	B	C	D	A	D	C	C	B	D	B	D	B	18	19	5	13
00-112	1	Riverine	B	A	A	A	A	B	B	A	B	B	C	C	C	A	14	19	8	17
00-127	1	Estuarine	B	A	A	B	B	A	B	A	A	A	C	D	A	A	32	63	19	21
00-160	1	Riverine	C	B	A	B	C	A	B	B	B	C	C	D	C	A	17	21	6	11
00-166	1	Riverine	C	D	D	C	B	B	D	C	B	C	C	D	A	A	32	21	12	16
00-166	2	Riverine	B	A	B	B	B	C	D	C	C	C	D	D	B	A	32	21	12	16
00-168	1	Riverine	A	B	B	C	C	B	B	B	B	B	B	C	B	A	32	40	12	13
01-017	1	Riverine	A	A	B	A	A	B	B	A	B	B	C	B	D	A	7	25	4	16
01-020	1	Riverine	A	A	A	B	B	A	B	B	B	B	D	D	D	A	15	23	9	15
01-135	1	Riverine	B	A	B	B	B	B	C	B	B	B	D	D	D	A	17	41	3	13
02-109	1	Estuarine	B	A	A	B	B	A	B	A	A	A	C	D	A	A	32	63	19	21

Table 15. UCLA -CRAM data by individual mitigation site (79 individual mitigation projects within 50 permit files).

File #	Mitigation Site #	Wetland Class	% of AA w/ Buffer	Ave Buffer Width	Buffer Conditions	Linear Contiguity	Source of Water	Hydroperiod	Upland Connection	Abiotic Patch Richness	Topographic Complexity	Sediment Integrity	Organic Matter Accumulation	Biotic Patch Richness	Vertical Structure	Interspersion/ Zonation	Plant Comm Integrity
91-02	1	Riverine	7	8	8	12	8	11	7	12	8	8	8	7	5	5	7
92-04	1	Riverine	2	12	10	11	8	7	6	7	8	10	10	7	9	11	12
92-10	1	Riverine	9	11	5	12	8	3	7	11	11	8	9	7	9	10	4
92-11	1	Estuarine	10	11	7	11	9	9	9	7	9	11	10	6	7	8	12
93-06	1	Riverine	11	5	5	11	5	7	7	11	10	11	11	8	11	11	11
93-09	1	Riverine	8	5	7	12	7	2	8	3	4	9	9	6	7	4	10
93-09	2	Riverine	12	11	9	10	6	8	11	10	8	11	11	7	12	12	12
93-15	1	Riverine	7	2	7	3	5	2	2	8	8	9	11	7	8	7	11
93-15	2	Riverine	7	12	9	2	4	1	3	1	1	2	2	2	2	1	2
93-15	3	Riverine	6	12	11	11	11	11	12	4	10	10	11	4	9	8	12
93-15	4	Riverine	3	11	11	4	4	4	4	1	1	2	6	3	5	6	12
93-19	1	Riverine	10	9	9	5	6	8	10	7	10	7	7	7	5	8	12
94-03	1	Riverine	2	3	2	5	8	2	3	6	7	3	2	2	1	1	11
94-03	2	Riverine	8	11	6	11	8	4	8	9	12	9	9	7	6	8	5
94-09	1	Riverine	3	11	9	12	8	10	10	10	11	8	5	3	1	1	10
95-003	1	Riverine	4	12	11	4	7	8	6	2	5	5	7	4	2	5	8
95-02	1	Riverine	3	4	8	11	6	7	6	9	9	11	12	9	12	9	10
95-02	2	Spring and Seep	12	12	12	3	5	4	N.A.	3	4	7	4	4	4	4	10
95-04	1	Riverine	3	11	8	4	7	7	7	6	8	7	6	4	2	6	8
95-062	1	Riverine	9	11	10	11	9	9	9	5	9	6	8	3	9	11	12
95-07	1	Riverine	6	10	4	9	7	8	1	1	1	8	1	2	1	1	5
95-08	1	Riverine	4	9	7	4	7	4	9	10	11	10	10	8	8	9	12
95-08	2	Riverine	6	9	10	8	7	8	9	6	8	8	7	7	6	10	12
95-08	3	Riverine	11	12	9	6	4	8	12	4	4	8	11	4	5	5	12
95-08	4	Riverine	12	12	11	6	4	8	12	6	4	9	10	6	4	6	12
95-091	1	Riverine	11	3	4	2	4	2	8	2	2	1	2	2	2	2	4
95-091	2	Riverine	1	2	4	2	4	2	4	2	2	1	2	2	2	2	7

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File #	Mitigation Site #	Wetland Class	% of AA w/ Buffer	Ave Buffer Width	Buffer Conditions	Linear Contiguity	Source of Water	Hydroperiod	Upland Connection	Abiotic Patch Richness	Topographic Complexity	Sediment Integrity	Organic Matter Accumulation	Biotic Patch Richness	Vertical Structure	Interspersion/ Zonation	Plant Comm Integrity
95-119	1	Riverine	2	2	8	1	8	8	8	3	5	10	8	4	8	9	11
95-119	2	Riverine	2	2	5	1	8	8	8	3	5	2	4	1	1	1	12
95-119	3	Riverine	12	7	10	11	8	8	10	7	8	7	5	3	2	2	12
96-086	1	Riverine	8	12	10	10	7	7	9	8	9	8	9	4	3	4	10
96-086	2	Riverine	8	12	7	10	7	7	9	8	9	8	6	4	6	4	6
96-086	3	Riverine	5	12	7	10	7	7	9	8	9	8	6	4	3	4	10
96-102	1	Estuarine	8	1	6	7	9	9	10	7	10	12	11	8	3	11	11
97-080	1	Riverine	7	12	10	10	7	7	10	7	7	10	8	6	2	10	11
97-088	1	Riverine	11	8	7	10	5	10	9	3	8	8	8	3	5	7	10
97-088	2	Riverine	12	10	10	11	6	10	10	3	10	8	8	3	7	8	12
97-103	1	Riverine	2	10	8	10	8	8	11	3	6	7	5	2	2	2	12
97-103	2	Riverine	3	11	8	10	7	7	8	6	8	8	8	4	5	2	5
97-129	1	Riverine	6	11	5	4	7	2	1	1	1	6	5	5	5	10	12
97-129	3	Riverine	7	7	1	4	1	1	8	1	1	2	2	1	1	1	1
97-133	1	Riverine	2	10	8	10	8	8	11	3	6	7	5	2	2	2	12
97-133	2	Riverine	3	11	8	10	7	7	8	6	8	8	8	4	5	2	5
97-170	1	Riverine	6	12	9	11	7	7	8	8	8	8	9	5	3	4	9
97-175	1	Riverine	7	11	7	10	6	8	11	3	5	8	6	4	6	2	5
97-203	1	Riverine	2	12	12	1	5	7	3	1	1	6	4	3	4	1	9
97-203	2	Riverine	10	7	4	6	4	7	4	2	1	6	4	3	5	1	8
98-015	1	Riverine	12	12	11	11	9	8	12	10	11	8	11	7	11	11	11
98-015	2	Riverine	12	12	11	11	9	8	9	10	11	8	11	7	7	11	11
98-015	3	Riverine	12	12	11	11	9	8	12	10	11	8	11	7	11	11	11
98-018	1	Riverine	7	11	11	9	7	7	9	9	9	8	9	5	6	8	10
98-032	1	Riverine	1	1	4	1	5	8	6	2	4	11	9	6	3	6	11
98-032	2	Riverine	7	8	7	9	4	8	7	6	7	8	8	4	5	8	10
98-072	1	Riverine	11	11	8	10	7	7	12	5	5	8	6	3	5	3	5
98-112	1	Riverine	6	12	11	6	9	9	7	2	2	8	6	4	5	5	11
98-112	2	Riverine	3	3	10	6	5	6	7	6	7	8	8	3	5	8	11
98-112	3	Riverine	3	3	9	8	7	8	11	1	4	8	8	3	7	1	12

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File #	Mitigation Site #	Wetland Class	% of AA w/ Buffer	Ave Buffer Width	Buffer Conditions	Linear Contiguity	Source of Water	Hydroperiod	Upland Connection	Abiotic Patch Richness	Topographic Complexity	Sediment Integrity	Organic Matter Accumulation	Biotic Patch Richness	Vertical Structure	Interspersion/ Zonation	Plant Comm Integrity
98-196	1	Estuarine	7	12	10	10	8	8	11	7	10	11	10	6	3	11	10
99-006	1	Lacustrine	12	4	7	8	9	9	N.A.	9	10	9	11	8	9	12	11
99-026	1	Riverine	8	8	12	12	8	8	7	10	10	9	10	4	8	3	11
99-026	2	Riverine	8	8	12	12	8	8	10	10	10	9	10	5	5	10	8
99-026	3	Riverine	8	8	12	12	8	8	3	10	10	9	10	4	11	3	7
99-037	1	Riverine	12	10	9	12	8	10	11	6	7	6	8	5	6	8	10
99-037	2	Riverine	8	11	10	12	8	10	11	7	9	9	11	6	11	9	10
99-045	1	Riverine	4	11	6	7	5	2	6	6	4	7	7	6	4	7	9
99-054	1	Riverine	7	12	8	8	8	8	8	5	6	5	5	3	4	2	11
99-055	1	Riverine	11	12	9	11	5	8	11	8	11	9	9	7	5	12	11
99-055	2	Riverine	10	12	8	10	8	8	4	5	7	5	4	4	5	2	11
99-100	1	Riverine	11	9	7	10	5	1	9	1	1	4	7	3	8	1	8
00-112	1	Riverine	9	11	10	12	11	11	9	7	11	8	7	4	5	5	12
00-127	1	Estuarine	7	12	10	10	8	8	11	7	10	11	10	6	3	11	10
00-160	1	Riverine	5	9	11	10	8	6	12	9	9	7	6	6	2	6	10
00-166	1	Riverine	7	2	1	8	5	7	9	3	6	7	6	6	3	11	12
00-166	2	Riverine	5	10	9	7	8	7	5	2	4	5	5	2	2	7	11
00-168	1	Riverine	10	8	8	3	6	5	7	9	9	8	7	7	4	7	12
01-017	1	Riverine	10	12	9	10	11	12	9	7	11	8	7	4	7	2	11
01-020	1	Riverine	11	11	10	11	9	9	10	7	8	8	7	3	2	2	10
01-135	1	Riverine	10	12	8	10	7	7	8	4	8	7	8	3	3	3	10
02-109	1	Estuarine	7	12	10	10	8	8	11	7	10	11	10	6	3	11	10

Table 16. Summary of condition of wetland mitigation sites based on UCLA-CRAM scores. Data are percent of the 79 mitigation sites falling in each category. Optimal was >79.2% of possible points, sub-optimal was <79.2% but >54.2% of possible points, and marginal to poor was <54.2%.

	Optimal	Sub-Optimal	Marginal to Poor
Overall	**4%**	**67%**	**29%**
Landscape context	9%	48%	43%
Hydrology	9%	68%	23%
Abiotic structure	18%	45%	37%
Biotic structure	9%	52%	39%

Table 17. Supplemental Qualitative Assessment Scores for all mitigation sites evaluated fully (79 sites within 50 files).

File #	Mitigation Site #	Plant Density	Plant Diversity	Total Native Plant % Cover	Total Invasive Plant % Cover	*Arundo donax* Presence	Impervious Substrate	Site Longevity	Plants Survive Without Artificial Watering	Overall Quality of habitat	Overall Success of Functional Replacement	Overall Success in Achieving Stated Goals of MitPlan/Permit Req	Appropriateness of Approved Permit Conditions
91-02	1	9	9	8	8	6	9	4	12	8	2	6	9
92-04	1	10	10	12	12	12	5	11	10	10	11	12	10
92-10	1	9	10	9	9	7	9	5	12	9	8	8	4
92-11	1	12	12	12	12	12	6	12	12	9	11	11	7
93-06	1	12	12	12	1	1	6	11	12	10	12	11	12
93-09	1	7	11	8	7	12	2	8	9	8	5	5	5
93-09	2	11	12	12	12	12	5	9	12	10	12	12	12
93-15	1	12	9	12	12	12	5	12	10	9	11	7	11
93-15	2	8	2	4	4	12	7	1	1	1	1	9	3
93-15	3	12	12	12	12	12	12	12	12	12	1	11	1
93-15	4	10	11	10	11	12	10	10	10	7	3	11	3
93-19	1	10	12	12	12	12	6	11	8	11	11	12	10
94-03	1	1	1	1	12	12	2	1	12	2	3	1	5
94-03	2	10	12	7	10	10	5	5	12	9	8	6	5
94-09	1	9	8	10	10	12	11	10	12	4	10	6	8
95-003	1	10	11	7	7	12	6	9	10	7	8	5	10
95-02	1	10	11	10	10	12	4	10	10	11	1	2	1
95-02	2	4	3	6	12	12	12	1	1	3	3	1	1
95-04	1	6	7	5	8	12	8	6	6	5	3	8	7
95-062	1	11	10	10	10	12	10	11	12	7	3	7	7
95-07	1	1	1	1	5	12	1	1	11	2	6	2	5
95-08	1	12	12	11	12	12	7	10	10	10	11	10	10
95-08	2	9	10	9	12	12	9	10	9	9	9	10	10
95-08	3	10	12	12	12	12	11	10	10	10	1	1	1
95-08	4	12	12	11	12	12	11	11	6	11	5	2	2
95-091	1	2	4	3	3	12	1	5	9	1	1	2	3
95-091	2	4	4	4	8	12	1	3	5	3	5	8	5
95-119	1	11	10	11	11	12	6	12	12	9	10	12	9
95-119	2	1	1	1	1	12	5	8	12	1	1	3	9
95-119	3	7	9	6	12	12	4	5	5	5	5	5	8
96-086	1	6	7	6	7	8	4	9	5	8	8	5	11
96-086	2	7	8	7	6	6	6	4	12	5	2	11	2
96-086	3	2	3	2	10	8	3	1	11	1	5	2	7
96-102	1	10	10	11	10	12	4	12	11	10	12	11	12
97-080	1	10	8	10	10	12	12	11	10	9	10	11	11
97-088	1	10	12	10	10	12	12	9	6	10	6	11	7
97-088	2	11	10	12	12	12	12	9	6	11	3	11	2
97-103	1	2	1	2	12	12	11	8	10	4	6	12	4
97-103	2	8	7	5	8	8	11	5	10	9	6	12	4

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File #	Mitigation Site #	Plant Density	Plant Diversity	Total Native Plant % Cover	Total Invasive Plant % Cover	*Arundo donax* Presence	Impervious Substrate	Site Longevity	Plants Survive Without Artificial Watering	Overall Quality of habitat	Overall Success of Functional Replacement	Overall Success in Achieving Stated Goals of MitPlan/Permit Req	Appropriateness of Approved Permit Conditions
97-129	1	8	9	9	10	12	7	11	12	7	9	10	10
97-129	3	10	1	1	1	12	5	8	11	1	1	1	2
97-133	1	2	1	2	12	12	11	8	10	4	6	12	4
97-133	2	8	7	5	8	8	11	5	10	9	6	12	4
97-170	1	12	5	10	10	8	12	10	12	6	11	7	7
97-175	1	5	7	2	7	11	10	3	12	5	5	10	4
97-203	1	9	5	6	8	12	12	8	1	2	2	2	3
97-203	2	10	5	7	7	12	8	8	3	3	3	2	3
98-015	1	12	11	9	10	11	11	12	11	9	11	12	11
98-015	2	7	10	8	11	10	5	8	12	10	5	12	8
98-015	3	12	6	12	12	12	3	10	12	8	7	2	6
98-018	1	12	11	11	11	12	6	5	6	7	5	6	6
98-032	1	10	4	11	12	12	5	5	5	6	5	8	5
98-032	2	10	10	10	11	12	5	7	7	5	7	7	9
98-072	1	2	3	1	4	12	10	3	5	2	2	3	8
98-112	1	12	12	9	12	12	12	12	9	4	4	11	4
98-112	2	11	10	6	11	12	7	10	10	10	8	11	9
98-112	3	10	12	10	10	12	10	12	11	5	2	11	2
98-196	1	11	11	10	10	12	3	11	11	10	12	10	12
99-006	1	11	10	10	10	12	11	12	10	10	12	12	12
99-026	1	9	11	11	11	12	4	11	10	9	5	11	5
99-026	2	7	10	8	8	12	4	11	8	8	5	11	5
99-026	3	11	11	9	9	5	4	12	12	9	5	2	5
99-037	1	10	10	11	11	12	12	9	5	7	6	10	5
99-037	2	10	10	9	9	12	12	11	10	9	4	10	7
99-045	1	11	10	8	10	12	4	2	12	6	4	8	8
99-054	1	7	10	10	10	12	9	8	7	5	6	10	6
99-055	1	11	12	5	12	12	11	11	10	10	11	12	11
99-055	2	10	10	2	12	12	10	8	8	3	3	4	11
99-100	1	10	8	10	10	12	3	11	11	5	2	2	5
00-112	1	9	9	10	12	12	10	10	9	10	12	12	12
00-127	1	11	11	10	10	12	3	11	11	10	12	10	12
00-160	1	6	10	7	10	12	10	9	7	7	9	11	9
00-166	1	12	12	11	11	12	10	8	10	11	11	12	12
00-166	2	8	4	3	11	12	6	6	11	5	5	6	9
00-168	1	8	11	9	12	12	12	10	8	9	10	11	11
01-017	1	9	6	8	12	12	12	11	11	10	11	12	11
01-020	1	7	9	5	7	10	10	11	11	4	12	12	10
01-135	1	7	4	5	11	12	4	9	12	6	2	2	2
02-109	1	11	11	10	10	12	3	11	11	10	12	10	12

Table 18. Estimated proportions of jurisdictional and/or non-jurisdictional habitat types present within the assessed boundaries of all 79 individual mitigation sites that comprised the set of 50 Phase II permit files. These proportions approximate those habitats that would have been recorded had wetland delineations been done at the mitigation sites.

File #	Mitigation Site #	Waters of the United States								Non-Waters of the US		
				Non-Wetland Waters								
					Streambed Habitats							
		Waters of the US (Total)	Wetland	Non-Wetland Waters (Total)	Streambed (Total)	Open Water	Unvegetated Streambed	Vegetated Streambed	Other	Non-Waters of the US (Total)	Riparian	Upland
91-02	1	100	30	70	70	0	30	40	0	0	0	0
92-04	1	75	20	55	25	10	0	15	30	25	25	0
92-10	1	90	0	90	0	0	0	0	90	10	10	0
92-11	1	100	30	70	0	0	0	0	70	0	0	0
93-06	1	70	40	30	20	10	0	10	10	30	25	5
93-09	1	1	1	0	0	0	0	0	0	99	74	25
93-09	2	90	80	10	0	0	0	0	10	10	10	0
93-15	1	80	50	30	0	0	0	0	30	20	10	0
93-15	2	0	0	0	0	0	0	0	0	0	0	100
93-15	3	10	0	10	10	0	5	5	0	90	40	50
93-15	4	0	0	0	0	0	0	0	0	100	10	90
93-19	1	80	60	20	0	0	0	0	20	20	10	10
94-03	1	100	0	100	100	0	95	5	0	0	0	0
94-03	2	100	10	90	80	0	40	40	10	0	0	0
94-09	1	90	0	90	90	0	30	60	0	10	10	0
95-003	1	10	10	0	0	0	0	0	0	90	30	60
95-02	1	0	0	0	0	0	0	0	0	100	70	30
95-02	2	25	20	5	5	5	0	0	0	75	25	50
95-04	1	30	10	20	15	0	10	5	5	70	60	10
95-062	1	5	2	3	3	0	0	3	0	95	30	65
95-07	1	100	0	100	100	0	70	30	0	0	0	0
95-08	1	75	55	20	0	0	0	0	20	25	10	15
95-08	2	30	20	10	0	0	0	0	10	70	40	30
95-08	3	10	0	10	0	0	0	0	10	90	70	20
95-08	4	20	10	10	0	0	0	0	10	80	80	0
95-091	1	60	0	60	60	0	59	1	0	40	10	30
95-091	2	0	0	0	0	0	0	0	0	100	0	100
95-119	1	90	90	0	0	0	0	0	0	10	5	5
95-119	2	70	0	70	60	0	59	1	10	30	10	20
95-119	3	15	0	15	0	0	0	0	15	85	10	75
96-086	1	30	0	30	0	0	0	0	30	70	70	10
96-086	2	0	0	0	0	0	0	0	0	100	60	40
96-086	3	100	5	95	95	0	90	5	0	0	0	0
96-102	1	95	95	0	0	0	0	0	0	5	0	5
97-080	1	40	30	10	0	0	0	0	10	60	20	40
97-088	1	0	0	0	0	0	0	0	0	100	40	60
97-088	2	0	0	0	0	0	0	0	0	100	50	50

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File #	Mitigation Site #	Waters of the United States								Non-Waters of the US		
				Non-Wetland Waters								
					Streambed Habitats							
		Waters of the US (Total)	Wetland	Non-Wetland Waters (Total)	Streambed (Total)	Open Water	Unvegetated Streambed	Vegetated Streambed	Other	Non-Waters of the US (Total)	Riparian	Upland
97-103	1	75	0	75	50	0	40	10	25	25	25	0
97-103	2	40	10	30	30	0	10	20	0	60	60	0
97-129	1	20	0	20	0	0	0	0	20	80	30	50
97-129	2	0	0	0	0	0	0	0	0	100	0	100
97-133	1	75	0	75	50	0	40	10	25	25	25	0
97-133	2	40	10	30	30	0	10	20	0	60	60	0
97-170	1	90	0	90	90	0	5	85	0	10	10	0
97-175	1	0	0	0	0	0	0	0	0	100	100	0
97-203	1	10	0	10	0	0	0	0	10	90	30	60
97-203	2	10	0	10	0	0	0	0	10	90	40	50
98-015	1	0	0	0	0	0	0	0	0	100	30	70
98-015	2	100	0	100	100	0	40	60	0	0	0	0
98-015	3	60	20	40	0	0	0	0	40	40	40	0
98-018	1	15	5	10	10	0	5	5	0	85	45	40
98-032	1	90	90	0	0	0	0	0	0	10	0	10
98-032	2	20	0	20	0	0	0	0	20	80	40	40
98-072	1	50	0	50	50	0	10	40	0	50	40	10
98-112	1	0	0	0	0	0	0	0	0	100	30	70
98-112	2	20	0	20	0	0	0	0	20	80	80	0
98-112	3	0	0	0	0	0	0	0	0	100	0	100
98-196	1	90	90	0	0	0	0	0	0	10	0	10
99-006	1	100	100	0	0	0	0	0	0	0	0	0
99-026	1	100	0	100	100	0	15	85	0	0	0	0
99-026	2	100	0	100	0	0	0	0	100	0	0	0
99-026	3	100	0	100	100	0	15	85	0	0	0	0
99-037	1	60	40	20	20	0	10	10	0	40	20	20
99-037	2	50	0	50	50	0	20	30	0	50	50	0
99-045	1	60	50	10	10	10	0	0	0	40	40	0
99-054	1	70	0	70	10	0	0	10	60	30	10	20
99-055	1	85	85	0	0	0	0	0	0	15	10	5
99-055	2	5	0	5	0	0	0	0	5	95	25	70
99-100	1	0	0	0	0	0	0	0	0	100	100	0
00-112	1	50	0	50	50	0	40	10	0	50	40	10
00-127	1	90	90	0	0	0	0	0	0	10	0	10
00-160	1	30	0	30	30	0	10	20	0	70	50	20
00-166	1	5	3	2	2	0	2	0	0	95	65	30
00-166	2	0	0	0	0	0	0	0	0	100	100	0
00-168	1	75	30	45	45	5	15	25	0	25	20	5
01-017	1	50	10	40	35	10	10	15	5	50	40	10
01-020	1	100	0	100	100	0	80	20	0	0	0	0
01-135	1	100	0	100	100	0	80	20	0	0	0	0
02-109	1	90	90	0	0	0	0	0	0	10	0	10

Table 19. A master summary of mitigation compliance and success results for all 55 permit files assessed (fifty permit files for which full functional evaluation was made and the five additional files with in-lieu fees, indicated by "NA"s in the table). Files where boundaries of the mitigation sites could not be determined or acres of mitigation were not specified are indicated by dashes. File #97-133 did not have assessable permit or mitigation plan conditions.

File #	Acres as percent of Acres Required	401 Permit Compliance	Mitigation Plan Compliance	Functional Evaluation Score
91-02	-	67	50	67
92-04	100	100	100	66
92-10	-	50	100	66
92-11	-	100	100	72
93-06	786	100	100	71
93-09	165	100	100	58
93-15	125	-	89	38
93-19	60	100	100	61
94-03	-	42	-	49
94-09	-	100	-	63
95-003	129	100	100	42
95-02	-	100	87	67
95-04	57	83	100	46
95-062	30	100	83	69
95-07	-	38	33	33
95-08	225	100	100	61
95-091	137	100	97	19
95-119	54	46	-	41
96-086	47	49	64	60
96-102	286	80	-	66
97-080	132	50	100	65
97-088	195	77	92	59
97-103	-	100	99	53
97-129	96	76	93	33
97-133	-	-	-	53
97-152	NA	100	NA	NA
97-170	-	100	100	61
97-175	58	100	100	52
97-203	31	-	64	29
98-015	81	-	100	84
98-018	115	100	90	65
98-032	233	100	100	53
98-055	NA	100	NA	NA
98-072	36	50	45	57
98-112	118	100	100	49
98-196	102	100	-	71
99-006	94	100	100	70
99-026	-	53	67	69
99-037	71	-	100	70
99-045	-	50	-	44
99-054	106	100	88	51
99-055	244	100	100	71
99-071	NA	100	NA	NA
99-100	-	100	-	41
00-112	-	100	-	73
00-127	-	100	-	71
00-160	141	88	89	62
00-166	166	100	100	50
00-168	267	-	100	54
01-017	170	100	100	71
01-020	106	100	100	66
01-135	117	100	60	57
02-018	NA	100	NA	NA
02-108	NA	100	NA	NA
02-109	-	100	-	71

Table 20. A master summary of mitigation compliance and success results for all 79 individual mitigation sites assessed fully. This list includes only those 50 permit files for which a full functional evaluation was possible (Phase II). It does not include the five additional files with non-tractable in-lieu fees that could only be assessed for compliance. Dashes in the compliance columns indicate that files either did not have assessable permit conditions or did not have permit conditions specified.

File #	Mitigation Site #	Wetland Class	401 Permit Compliance	Mitigation Plan Compliance	Functional Evaluation Score
91-02	1	Riverine	67	50	67
92-04	1	Riverine	100	100	66
92-10	1	Riverine	50	100	66
92-11	1	Estuarine	100	100	72
93-06	1	Riverine	100	100	71
93-09	1	Riverine	100	100	52
93-09	2	Riverine	100	100	79
93-15	1	Riverine	-	100	46
93-15	2	Riverine	-	100	20
93-15	3	Riverine	-	44	76
93-15	4	Riverine	-	-	31
93-19	1	Riverine	100	100	61
94-03	1	Riverine	33	-	33
94-03	2	Riverine	50	-	65
94-09	1	Riverine	100	-	63
95-003	1	Riverine	100	100	42
95-02	1	Riverine	100	88	67
95-02	2	Spring and Seep	100	40	46
95-04	1	Riverine	83	100	46
95-062	1	Riverine	100	83	69
95-07	1	Riverine	38	33	33
95-08	1	Riverine	100	100	61
95-08	2	Riverine	100	100	62
95-08	3	Riverine	100	100	58
95-08	4	Riverine	100	100	63
95-091	1	Riverine	100	86	21
95-091	2	Riverine	100	100	19
95-119	1	Riverine	100	-	47
95-119	2	Riverine	0	-	33
95-119	3	Riverine	100	-	61
96-086	1	Riverine	50	33	63
96-086	2	Riverine	50	67	59
96-086	3	Riverine	40	0	58
96-102	1	Estuarine	80	-	66
97-080	1	Riverine	50	100	65
97-088	1	Riverine	75	92	59
97-088	2	Riverine	100	100	69
97-103	1	Riverine	100	92	51
97-103	2	Riverine	100	100	53
97-129	1	Riverine	80	100	35
97-129	3	Riverine	25	0	17

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File #	Mitigation Site #	Wetland Class	401 Permit Compliance	Mitigation Plan Compliance	Functional Evaluation Score
97-133	1	Riverine	-	-	51
97-133	2	Riverine	-	-	53
97-170	1	Riverine	100	100	61
97-175	1	Riverine	100	100	52
97-203	1	Riverine	-	64	28
97-203	2	Riverine	-	64	34
98-015	1	Riverine	-	100	84
98-015	2	Riverine	-	100	81
98-015	3	Riverine	-	100	84
98-018	1	Riverine	100	90	65
98-032	1	Riverine	100	100	41
98-032	2	Riverine	100	100	55
98-072	1	Riverine	50	46	57
98-112	1	Riverine	100	100	51
98-112	2	Riverine	100	100	49
98-112	3	Riverine	100	100	49
98-196	1	Estuarine	100	-	71
99-006	1	Lacustrine	100	100	70
99-026	1	Riverine	67	100	69
99-026	2	Riverine	67	100	72
99-026	3	Riverine	25	0	66
99-037	1	Riverine	-	100	69
99-037	2	Riverine	-	100	76
99-045	1	Riverine	50	-	44
99-054	1	Riverine	100	88	51
99-055	1	Riverine	100	100	75
99-055	2	Riverine	100	100	54
99-100	1	Riverine	100	-	41
00-112	1	Riverine	100	-	73
00-127	1	Estuarine	100	-	71
00-160	1	Riverine	88	89	62
00-166	1	Riverine	100	100	50
00-166	2	Riverine	71	100	43
00-168	1	Riverine	-	100	54
01-017	1	Riverine	100	100	71
01-020	1	Riverine	100	100	66
01-135	1	Riverine	100	60	57
02-109	1	Estuarine	100	-	71

Table 21. Complete list of 50 permit files evaluated fully ranked by their overall 401 Permit Compliance (calculated per file using proportional acreage estimates for files with multiple mitigation sites). Files are secondarily (though arbitrarily) ordered by date. The six files at the bottom of the table did not have assessable 401 Permit Conditions.

File #	Project Title	401 Permit Compliance
02-109	Proposed Aircraft Parking Apron, Point Mugu Site, Milcon P-267 Project (Corps' Project No. 2002-01100-MDC), Drainage to Mugu Lagoon, City of Point Mugu, Ventura County	100
01-135	Proposed Encasement of the Ojai Valley Main at San Antonio Creek Project (Corps' Project No 2001-01401-JWM), San Antonio Creek and Ventura River, City of Ojai, Ventura County	100
01-020	Proposed Stonecrest Replacement Sewer Pipeline Project (Corps' Project No 2001-00677-AOA), Santa Clara River, City of Santa Clarita, Los Angeles County	100
01-017	Proposed Fish Creek Restoration Project (Corps' Project No 2001-00723-AOA), Near the City of Azusa, Los Angeles County	100
00-166	"After the Fact" Proposed Las Posas Basin Aquifer Storage and Recovery Program (Corps' Project No 2001-00402-SDM), Grimes Canyon Creek, Tributary to Arroyo Simi, City of Moorpark, Ventura County	100
00-127	Proposed Auto Hobby Shop Project (Corps' Project No 2000-01775-SDM), Unnamed Wetland Adjacent to Oxnard Drainage Ditch #2, Tributary to Mugu Lagoon, Ventura County	100
00-112	Proposed Route 30 San Antonio Channel Box Culvert Project (Corps' Project No. 2000-01778-PJF), San Antonio Creek, City of Claremont, Los Angeles County	100
99-100	Proposed Telegraph Road Drain Project (Corps Project No 98-00170-PMG), Unnamed Tributary to Sorenson Avenue Drain, City of Whittier, Los Angeles County	100
99-055	Proposed Hill Canyon Treatment Plant Phase II Flood Control Improvements Project (Corps' Project No 2001-00018-SDM), North Fork Arroyo Conejo, City of Thousand Oaks, Ventura County	100
99-054	Proposed Golden Valley Road Extension Project (Corps' Project No 199915603-JPL), Oro Fino Creek, City of Santa Clarita, Los Angeles County	100
99-006	Sinaloa Lake Phase II Project, An Artificial Lake Tributary to Arroyo Simi, Simi Valley, Ventura County (Corps' File No 985047900-JPL)	100
98-196	Proposed Parking and Road Extension for Community Support and Recreation Area (Corps' Project No. 9850362-LM), Unnamed Water, Point Mugu, Ventura County	100
98-112	Proposed Lake Eleanor Hills Residential Development Project (Tract 47962), Unnamed Tributary to Lake Eleanor, City of Westlake Village, Los Angeles County	100
98-032	Rancho Del-Tio Development	100
98-018	John Laing Homes (Stevenson Ranch Phase IV), Pico Canyon Creek and Unnamed Tributaries to Dewitt Canyon Creek, City of Santa Clarita, Los Angeles County	100
97-175	Valley Crest Tree Company (Corps' File No 98-50234-BAH)	100
97-170	Proposed Construction of Groins in the Santa Clara River, Del Valle, Los Angeles County	100
97-103	Proposed Desilting Basin Outlet Construction, Calleguas Creek, City of Camarillo, Ventura County	100
95-091	Proposed Borchard Road/Route 101 Freeway Interchange Improvement Project, South Branch Arroyo Conejo, Tributary to Calleguas Creek, Newbury Park, Thousand Oaks, Ventura County	100
95-08	Dos Vientos Development Project, Courtly Homes, Tributaries to South Branch-Arroyo Conejo, Thousand Oaks, Ventura County	100

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File #	Project Title	401 Permit Compliance
95-062	Proposed Bank Stabilizaton and Stream Diversion (7-VEN-150, 462811), Casitas Creek Slide, Route 150, 1.6 Miles from Ventua-Santa Barbara County Line, Ventura County	100
95-02	Proposed Development of the Oak Park Zone III Residential Community, North of City of Agoura Hills, Ventura County	100
95-003	Proposed Diamond Ranch High School Construction, Tributaries to Santa Ana River, Chino Basin, South of SR-60 (Pomona Fwy) and West of Chino Hills Parkway, Diamond Bar, Los Angeles County	100
94-09	Southern Pacific Milling Company Excavation Mining, Boulder Creek, Santa Clara River, Ventura County	100
93-19	Maguire Thomas Partners, Playa Vista Phase I Development Project (Ballona Wetlands and Tributaries, Ballona Flood Control Channel, Centinela Ditch, and Scattered Wetlands), Los Angeles County	100
93-09	Sunshine Canyon Landfill, Southwest of Antelope Freeway (State Route 14) and Golden State Freeway (Interstate 5), Los Angeles County (FKA 91-06)	100
93-06	Medea Creek Restoration Project (Case No. 92-SPR-011), Morrison Ranch, Agoura Hills, Los Angeles County	100
92-11	Replacement of Malibu Lagoon Bridge	100
92-04	42-Acre Residential Development Project, Raznick Realty Group, Tentative Tracts 3666-2 and 4754, Conejo Mountain Creek, City of Thousand Oaks, Ventura County	100
00-160	Proposed V.T.T.M. 45645- Hasley Canyon Project (Corps' Project No. 2001-00315-AOA), Unnamed Drainages Tributary to Castaic Creek, Val Verde Area, Los Angeles County	88
95-04	Propsed Tick Canyon Bridge Project (No 53-1547 R/L; Rile: 07-LA-14, PM 33.4/43.3), Median Widening, Route 14, Santa Clarita Valley, Los Angeles County	83
96-102	Proposed Mugu Neighborhood Parks Project, Naval Air Weapons Station, Point Mugu, Ventura County	80
97-088	Proposed Toland Road Landfill Expansion Project, Unnamed Tributary to O'Leary Creek, Cities of Santa Paula and Fillmore, Ventura County	77
97-129	Expansion of Santa Fe Reservoir Spreading Grounds (Corps' File Nos OPN-95-02, 97-00379-MD)	76
91-02	Ventura County, Conejo Creek Streambank Protection Project	67
99-026	Avenue Scott Bridge Construction Project, San Francisquito Creek, City of Santa Clarita, Los Angeles County (Corps' File No. 94-00504-BAH)	53
99-045	Proposed Arroyo Simi Channel Replacement Project (Corps' Project No. 99-0006700-JPL), City of Simi Valley, Ventura Co.	50
98-072	Proposed Malibu Terrace Project, Unnamed Tributaries to Las Virgenes Creek, Northwest of Calabasas, Los Angeles County	50
97-080	Proposed Mount Sinai Memorial Park Project (95-50256-BAH), White Oak Creek and Tributaries, City of Simi Valley, Ventura County	50
92-10	Tierra Rejada Sanitary Landfill Emergency Flood Protection, Arroyo Simi, City of Simi Valley, Ventura County	50
96-086	Proposed Santa Clara River Trail Phase III, Santa Clara River/Santa Clara River - South Fork, City of Santa Clarita, Los Angeles County	49
95-119	Proposed Tract No. 3467 Residential Development and Bridge Crossing Project, Royal Oak Partners, South of Simi Valley Freeway (118) and West of Tapo Road, Runkle Creek and Arroyo Simi, Simi Valley, Ventura County	46
94-03	Arroyo Simi, Ventura County, Repair of Embankments and Utility Lines	42
95-07	Proposed Walnut Creek Bridge Widening Project (07-LA-605; 119940) on Route 605, South of Route 10, West Covina, Los Angeles County	38
00-168	Proposed Camarillo II - Tract 5248 Project (Corps Project No. 2000-00200-SDM), Calleguas Creek, City of Camarillo, Ventura Co.	No assessable conditions in this permit
99-037	Casitas Dam Seismic Retrofit Project, Lake Casitas and Coyote Creek, Ventura Co. (USACE File No 985032400-LM)	No assessable conditions in this permit

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File #	Project Title	401 Permit Compliance
98-015	Proposed Unit W and Unit F Interceptor Improvements Project and Completed Activities (Corps File No. 97-50293-LM), Arroyo Conejo Creek, City of Thousand Oaks, Ventura County	No assessable conditions in this permit
97-203	Proposed Residential Development for Tentative Tract No. 46493, Unnamed Tributaries to Big Tujunga Wash, Sunland-Tujunga Area, Los Angeles Co.	No assessable conditions in this permit
97-133	Proposed Westport Homes (Tract T-4103) Development Project, Unnamed Tributary to Conejo Creek, City of Camarillo, Ventura County	No assessable conditions in this permit
93-15	The Lusk Company, Ridgemoor Residential Development, San Jose Creek, Rowland Heights, Los Angeles County	No assessable conditions in this permit

Table 22. Complete list of 50 fully assessed permit files ranked by their overall score in complying with the Mitigation Plan Conditions. Files are secondarily (though arbitrarily) ordered by date. The eleven files at the bottom of the table either did not have assessable Mitigation Plan Conditions or did not have Mitigation Plans available.

File #	Project Title	Mitigation Plan Compliance
01-020	Proposed Stonecrest Replacement Sewer Pipeline Project (Corps' Project No 2001-00677-AOA), Santa Clara River, City of Santa Clarita, Los Angeles County	100
01-017	Proposed Fish Creek Restoration Project (Corps' Project No 2001-00723-AOA), Near the City of Azusa, Los Angeles County	100
00-168	Proposed Camarillo II - Tract 5248 Project (Corps' Project No. 2000-00200-SDM), Calleguas Creek, City of Camarillo, Ventura County	100
00-166	"After the Fact" Proposed Las Posas Basin Aquifer Storage and Recovery Program (Corps' Project No 2001-00402-SDM), Grimes Canyon Creek, Tributary to Arroyo Simi, City of Moorpark, Ventura County	100
99-055	Proposed Hill Canyon Treatment Plant Phase II Flood Control Improvements Project (Corps' Project No 2001-00018-SDM), North Fork Arroyo Conejo, City of Thousand Oaks, Ventura County	100
99-037	Casitas Dam Seismic Retrofit Project, Lake Casitas and Coyote Creek, Ventura County (USACE File No 985032400-LM)	100
99-006	Sinaloa Lake Phase II Project, An Artificial Lake Tributary to Arroyo Simi, Simi Valley, Ventura County (Corps' File No 985047900-JPL)	100
98-112	Proposed Lake Eleanor Hills Residential Development Project (Tract 47962), Unnamed Tributary to Lake Eleanor, City of Westlake Village, Los Angeles County	100
98-032	Rancho Del-Tio Development	100
98-015	Proposed Unit W and Unit F Interceptor Improvements Project and Completed Activities (Corps' File No. 97-50293-LM), Arroyo Conejo Creek, City of Thousand Oaks, Ventura County	100
97-175	Valley Crest Tree Company (Corps' File No 98-50234-BAH)	100
97-170	Proposed Construction of Groins in the Santa Clara River, Del Valle, Los Angeles County	100
97-080	Proposed Mount Sinai Memorial Park Project (95-50256-BAH), White Oak Creek and Tributaries, City of Simi Valley, Ventura County	100
95-08	Dos Vientos Development Project, Courtly Homes, Tributaries to South Branch-Arroyo Conejo, Thousand Oaks, Ventura County	100
95-04	Proposed Tick Canyon Bridge Project (No 53-1547 R/L; Rile: 07-LA-14, PM 33.4/43.3), Median Widening, Route 14, Santa Clarita Valley, Los Angeles County	100
95-003	Proposed Diamond Ranch High School Construction, Tributaries to Santa Ana River, Chino Basin, South of SR-60 (Pomona Fwy) and West of Chino Hills Parkway, Diamond Bar, Los Angeles County	100
93-19	Maguire Thomas Partners, Playa Vista Phase I Development Project (Ballona Wetlands and Tributaries, Ballona Flood Control Channel, Centinela Ditch, and Scattered Wetlands), Los Angeles County	100
93-09	Sunshine Canyon Landfill, Southwest of Antelope Freeway (State Route 14) and Golden State Freeway (Interstate 5), Los Angeles County (FKA 91-06)	100
93-06	Medea Creek Restoration Project (Case No. 92-SPR-011), Morrison Ranch, Agoura Hills, Los Angeles County	100
92-11	Replacement of Malibu Lagoon Bridge	100
92-10	Tierra Rejada Sanitary Landfill Emergency Flood Protection, Arroyo Simi, City of Simi Valley, Ventura County	100
92-04	42-Acre Residential Development Project, Raznick Realty Group, Tentative Tracts 3666-2 and 4754, Conejo Mountain Creek, City of Thousand Oaks, Ventura County	100
97-103	Proposed Desilting Basin Outlet Construction, Calleguas Creek, City of Camarillo, Ventura County	99

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File #	Project Title	Mitigation Plan Compliance
95-091	Proposed Borchard Road/Route 101 Freeway Interchange Improvement Project, South Branch Arroyo Conejo, Tributary to Calleguas Creek, Newbury Park, Thousand Oaks, Ventura County	97
97-129	Expansion of Santa Fe Reservoir Spreading Grounds (Corps' File Nos OPN-95-02, 97-00379-MD)	93
97-088	Proposed Toland Road Landfill Expansion Project, Unnamed Tributary to O'Leary Creek, Cities of Santa Paula and Fillmore, Ventura County	92
98-018	John Laing Homes (Stevenson Ranch Phase IV), Pico Canyon Creek and Unnamed Tributaries to Dewitt Canyon Creek, City of Santa Clarita, Los Angeles County	90
00-160	Proposed V.T.T.M. 45645- Hasley Canyon Project (Corps Project No. 2001-00315-AOA), Unnamed Drainages Tributary to Castaic Creek, Val Verde Area, Los Angeles County	89
93-15	The Lusk Company, Ridgemoor Residential Development, San Jose Creek, Rowland Heights, Los Angeles County	89
99-054	Proposed Golden Valley Road Extension Project (Corps' Project No 199915603-JPL), Oro Fino Creek, City of Santa Clarita, Los Angeles County	88
95-02	Proposed Development of the Oak Park Zone III Residential Community, North of City of Agoura Hills, Ventura County	87
95-062	Proposed Bank Stabilizaton and Stream Diversion (7-VEN-150, 462811), Casitas Creek Slide, Route 150, 1.6 Miles from Ventua-Santa Barbara County Line, Ventura County	83
99-026	Avenue Scott Bridge Construction Project, San Francisquito Creek, City of Santa Clarita, Los Angeles (Corps' File No. 94-00504-BAH)	67
97-203	Proposed Residential Development for Tentative Tract No. 46493, Unnamed Tributaries to Big Tujunga Wash, Sunland-Tujunga Area, Los Angeles County	64
96-086	Proposed Santa Clara River Trail Phase III, Santa Clara River/Santa Clara River - South Fork, City of Santa Clarita, Los Angeles County	64
01-135	Proposed Encasement of the Ojai Valley Main at San Antonio Creek Project (Corps Project No 2001-01401-JWM), San Antonio Creek and Ventura River, City of Ojai, Ventura County	60
91-02	Ventura County, Conejo Creek Streambank Protection Project	50
98-072	Proposed Malibu Terrace Project, Unnamed Tributaries to Las Virgenes Creek, Northwest of Calabasas, Los Angeles County	45
95-07	Proposed Walnut Creek Bridge Widening Project (07-LA-605; 119940) on Route 605, South of Route 10, West Covina, Los Angeles County	33
97-133	Proposed Westport Homes (Tract T-4103) Development Project, Unnamed Tributary to Conejo Creek, City of Camarillo, Ventura County	No assessable Mitigation Plan Conditions
02-109	Proposed Aircraft Parking Apron, Point Mugu Site, Milcon P-267 Project (Corps' Project No. 2002-01100-MDC), Drainage to Mugu Lagoon, City of Point Mugu, Ventura Co.	Mitigation Plan not available
00-127	Proposed Auto Hobby Shop Project (Corps' Project No 2000-01775-SDM), Unnamed Wetland Adjacent to Oxnard Drainage Ditch #2, Tributary to Mugu Lagoon, Ventura County	Mitigation Plan not available
00-112	Proposed Route 30 San Antonio Channel Box Culvert Project (Corps' Project No. 2000-01778-PJF), San Antonio Creek, City of Claremont, LA County	Mitigation Plan not available
99-100	Proposed Telegraph Road Drain Project (Corps' Project No 98-00170-PMG), Unnamed Tributary to Sorenson Avenue Drain, City of Whittier, Los Angeles County	Mitigation Plan not available
99-045	Proposed Arroyo Simi Channel Replacement Project (Corps' Project No. 99-0006700-JPL), City of Simi Valley, Ventura County	Mitigation Plan not available
98-196	Proposed Parking and Road Extension for Community Support and Recreation Area (Corps' Project No. 9850362-LM), Unnamed Water, Point Mugu, Ventura County	Mitigation Plan not available
96-102	Proposed Mugu Neighborhood Parks Project, Naval Air Weapons Station, Point Mugu, Ventura County	Mitigation Plan not available

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File #	Project Title	Mitigation Plan Compliance
95-119	Proposed Tract No. 3467 Residential Development and Bridge Crossing Project, Royal Oak Partners, South of Simi Valley Freeway (118) and West of Tapo Road, Runkle Creek and Arroyo Simi, Simi Valley, Ventura County	Mitigation Plan not available
94-09	Southern Pacific Milling Company Excavation Mining, Boulder Creek, Santa Clara River, Ventura County	Mitigation Plan not available
94-03	Arroyo Simi, Ventura County, Repair of Embankments and Utility Lines	Mitigation Plan not available

Table 23. Complete list of 50 fully assessed permit files ranked by their overall UCLA -CRAM functional evaluation score. Files are secondarily (though arbitrarily) ordered by date.

File #	Project Title	UCLA CRAM
98-015	Proposed Unit W and Unit F Interceptor Improvements Project and Completed Activities (Corps' File No. 97-50293-LM), Arroyo Conejo Creek, City of Thousand Oaks, Ventura County	84
00-112	Proposed Route 30 San Antonio Channel Box Culvert Project (Corps' Project No. 2000-01778-PJF), San Antonio Creek, City of Claremont, LA County	73
92-11	Replacement of Malibu Lagoon Bridge	72
02-109	Proposed Aircraft Parking Apron, Point Mugu Site, Milcon P-267 Project (Corps' Project No. 2002-01100-MDC), Drainage to Mugu Lagoon, City of Point Mugu, Ventura County	71
01-017	Propsed Fish Creek Restoration Project (Corps' Project No 2001-00723-AOA), Near the City of Azusa, Los Angeles County	71
00-127	Proposed Auto Hobby Shop Project (Corps' Project No 2000-01775-SDM), Unnamed Wetland Adjacent to Oxnard Drainage Ditch #2, Tributary to Mugu Lagoon, Ventura County	71
98-196	Proposed Parking and Road Extension for Community Support and Recreation Area (Corps' Project No. 9850362-LM), Unnamed Water, Point Mugu, Ventura County	71
99-055	Proposed Hill Canyon Treatment Plant Phase II Flood Control Improvements Project (Corps' Project No 2001-00018-SDM), North Fork Arroyo Conejo, City of Thousand Oaks, Ventura County	71
93-06	Medea Creek Restoration Project (Case No. 92-SPR-011), Morrison Ranch, Agoura Hills, Los Angeles County	71
99-037	Casitas Dam Seismic Retrofit Project, Lake Casitas and Coyote Creek, Ventura Co. (USACE File No 985032400-LM)	70
99-006	Sinaloa Lake Phase II Project, An Artificial Lake Tributary to Arroyo Simi, Simi Valley, Ventura County (Corps' File No 985047900-JPL)	70
95-062	Proposed Bank Stabilization and Stream Diversion (7-VEN-150, 462811), Casitas Creek Slide, Route 150, 1.6 Miles from Ventura-Santa Barbara County Line, Ventura County	69
99-026	Avenue Scott Bridge Construction Project, San Francisquito Creek, City of Santa Clarita, Los Angeles (Corps File No. 94-00504-BAH)	69
95-02	Proposed Development of the Oak Park Zone III Residential Community, North of City of Agoura Hills, Ventura County	67
91-02	Ventura County, Conejo Creek Streambank Protection Project	67
01-020	Proposed Stonecrest Replacement Sewer Pipeline Project (Corps' Project No 2001-00677-AOA), Santa Clara River, City of Santa Clarita, Los Angeles County	66
96-102	Proposed Mugu Neighborhood Parks Project, Naval Air Weapons Station, Point Mugu, Ventura County	66
92-10	Tierra Rejada Sanitary Landfill Emergency Flood Protection, Arroyo Simi, City of Simi Valley, Ventura County	66
92-04	42-Acre Residential Development Project, Raznick Realty Group, Tentative Tracts 3666-2 and 4754, Conejo Mountain Creek, City of Thousand Oaks, Ventura County	66
98-018	John Laing Homes (Stevenson Ranch Phase IV), Pico Canyon Creek and Unnamed Tributaries to Dewitt Canyon Creek, City of Santa Clarita, Los Angeles County	65
97-080	Proposed Mount Sinai Memorial Park Project (95-50256-BAH), White Oak Creek and Tributaries, City of Simi Valley, Ventura County	65
94-09	Southern Pacific Milling Company Excavation Mining, Boulder Creek, Santa Clara River, Ventura County	63

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File #	Project Title	UCLA CRAM
00-160	Proposed V.T.T.M. 45645- Hasley Canyon Project (Corps Project No. 2001-00315-AOA), Unnamed Drainages Tributary to Castaic Creek, Val Verde Area, Los Angeles County	62
97-170	Proposed Construction of Groins in the Santa Clara River, Del Valle, Los Angeles County	61
95-08	Dos Vientos Development Project, Courtly Homes, Tributaries to South Branch-Arroyo Conejo, Thousand Oaks, Ventura County	61
93-19	Maguire Thomas Partners, Playa Vista Phase I Development Project (Ballona Wetlands and Tributaries, Ballona Flood Control Channel, Centinela Ditch, and Scattered Wetlands), LA County	61
96-086	Proposed Santa Clara River Trail Phase III, Santa Clara River/Santa Clara River - South Fork, City of Santa Clarita, Los Angeles County	60
97-088	Proposed Toland Road Landfill Expansion Project, Unnamed Tributary to O'Leary Creek, Cities of Santa Paula and Fillmore, Ventura County	59
93-09	Sunshine Canyon Landfill, Southwest of Antelope Freeway (State Route 14) and Golden State Freeway (Interstate 5), Los Angeles County (FKA 91-06)	58
01-135	Proposed Encasement of the Ojai Valley Main at San Antonio Creek Project (Corps Project No 2001-01401-JWM), San Antonio Creek and Ventura River, City of Ojai, Ventura County	57
98-072	Proposed Malibu Terrace Project, Unnamed Tributaries to Las Virgenes Creek, Northwest of Calabasas, Los Angeles County	57
00-168	Proposed Camarillo II - Tract 5248 Project (Corps' Project No. 2000-00200-SDM), Calleguas Creek, City of Camarillo, Ventura County	54
98-032	Rancho Del-Tio Development	53
97-133	Proposed Westport Homes (Tract T-4103) Development Project, Unnamed Tributary to Conejo Creek, City of Camarillo, Ventura County	53
97-103	Proposed Desilting Basin Outlet Construction, Calleguas Creek, City of Camarillo, Ventura County	53
97-175	Valley Crest Tree Company (Corps' File No 98-50234-BAH)	52
99-054	Proposed Golden Valley Road Extension Project (Corps' Project No. 199915603-JPL), Oro Fino Creek, City of Santa Clarita, Los Angeles County	51
00-166	"After the Fact" Proposed Las Posas Basin Aquifer Storage and Recovery Program (Corps Project No 2001-00402-SDM), Grimes Canyon Creek, Tributary to Arroyo Simi, City of Moorpark, Ventura County	50
98-112	Proposed Lake Eleanor Hills Residential Development Project (Tract 47962), Unnamed Tributary to Lake Eleanor, City of Westlake Village, Los Angeles County	49
94-03	Arroyo Simi, Ventura County, Repair of Embankments and Utility Lines	49
95-04	Proposed Tick Canyon Bridge Project (No 53-1547 R/L; Rile: 07-LA-14, PM 33.4/43.3), Median Widening, Route 14, Santa Clarita Valley, Los Angeles County	46
99-045	Proposed Arroyo Simi Channel Replacement Project (Corps' Project No. 99-0006700-JPL), City of Simi Valley, Ventura County	44
95-003	Proposed Diamond Ranch High School Construction, Tributaries to Santa Ana River, Chino Basin, South of SR-60 (Pomona Fwy) and West of Chino Hills Parkway, Diamond Bar, Los Angeles County	42
99-100	Proposed Telegraph Road Drain Project (Corps' Project No 98-00170-PMG), Unnamed Tributary to Sorenson Avenue Drain, City of Whittier, Los Angeles County	41
95-119	Proposed Tract No. 3467 Residential Development and Bridge Crossing Project, Royal Oak Partners, South of Simi Valley Freeway (118) and West of Tapo Road, Runkle Creek and Arroyo Simi, Simi Valley, Ventura County	41
93-15	The Lusk Company, Ridgemoor Residential Development, San Jose Creek, Rowland Heights, Los Angeles County	38

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File #	Project Title	UCLA CRAM
97-129	Expansion of Santa Fe Reservoir Spreading Grounds (Corps' File Nos OPN-95-02, 97-00379-MD)	33
95-07	Proposed Walnut Creek Bridge Widening Project (07-LA-605; 119940) on Route 605, South of Route 10, West Covina, Los Angeles County	33
97-203	Proposed Residential Development for Tentative Tract No. 46493, Unnamed Tributaries to Big Tujunga Wash, Sunland-Tujunga Area, Los Angeles County	29
95-091	Proposed Borchard Road/Route 101 Freeway Interchange Improvement Project, South Branch Arroyo Conejo, Tributary to Calleguas Creek, Newbury Park, Thousand Oaks, Ventura County	19

Table 24. Mitigation success by permit file. Data shown are percentages out of a total number of 50 permit files. The evaluation for 401 conditions was out of 55 files due to the inclusion of the 5 permits which had in-lieu fees paid that could not be tracked to specific mitigation projects. Numbers in parentheses are the actual number of sites within each category. For the UCLA-CRAM functional evaluation, success means "optimal wetland condition," partial success means "suboptimal" condition, and failure means "marginal to poor" condition. See the text for a full description of the success categories.

Category	Success	Partial Success	Failure	Cannot be Determined
Acreage Requirement	46 (23)	Not a category	24 (12)	30 (15)
401 Conditions	60 (33)	29 (16)	0 (0)	11 (6)
Mitigation Plan Conditions	44 (22)	34 (17)	0 (0)	22 (11)
Functional Evaluation	2 (1)	60 (30)	38 (19)	0 (0)

Table 25. Mitigation success by individual mitigation site. Data shown are from the set of 50 fully assessed permit files, and are percentages out of a total number of 79 individual mitigation sites. Numbers in parentheses are the actual number of sites within each category. For the UCLA-CRAM functional evaluation, success means "optimal wetland condition," partial success means "suboptimal" condition, and failure means "marginal to poor" condition. See the text for a full description of the success categories.

Category	Success	Partial Success	Failure	Cannot be Determined
401 Conditions	54 (43)	27 (21)	1 (1)	18 (14)
Mitigation Plan Conditions	53 (42)	23 (18)	4 (3)	20 (16)
Functional Evaluation	4 (3)	56 (44)	41 (32)	0 (0)

Table 26. Overall mitigation success by permit file. For all 55 permit files, each of the success criteria questions below were assigned one of the following answers: Yes, Mostly, Partially, Barely, No-but Nearly or No. For some sites these questions were either not relevant (NA), or couldn't be assessed (ND).

File #	Was Acreage Requirement Met?	Was 401 Compliance Met?	Was Mitigation Plan (All Agencies) Compliance Met?	Is Function Optimal?
91-02	ND	Partially	Partially	Partially
92-04	Yes	Yes	Yes	Partially
92-10	ND	Partially	Yes	Partially
92-11	ND	Yes	Yes	Partially
93-06	Yes	Yes	Yes	Partially
93-09	Yes	Yes	Yes	Barely
93-15	Yes	ND	Mostly	No
93-19	No	Yes	Yes	Partially
94-03	ND	Partially	ND	No
94-09	ND	Yes	ND	Partially
95-003	Yes	Yes	Yes	No
95-02	Yes	Yes	Mostly	Partially
95-04	No	Mostly	Yes	No
95-062	No	Yes	Mostly	Partially
95-07	ND	Partially	Partially	No
95-08	Yes	Yes	Yes	Partially
95-091	Yes	Yes	Mostly	No
95-119	No	Partially	ND	No
96-086	No	Partially	Partially	Partially
96-102	Yes	Mostly	ND	Partially
97-080	Yes	Partially	Yes	Partially
97-088	Yes	Mostly	Mostly	Barely
97-103	ND	Yes	Mostly	No-but Nearly
97-129	No	Mostly	Mostly	No
97-133	ND	ND	NA	No-but Nearly
97-152	NA	Yes	NA	NA
97-170	ND	Yes	Yes	Partially
97-175	No	Yes	Yes	No-but Nearly
97-203	No	ND	Partially	No
98-015	No	ND	Yes	Yes
98-018	Yes	Yes	Mostly	Partially
98-032	Yes	Yes	Yes	No-but Nearly
98-055	NA	Yes	NA	NA
98-072	No	Partially	Partially	Barely
98-112	Yes	Yes	Yes	No-but Nearly
98-196	Yes	Yes	ND	Partially
99-006	No	Yes	Yes	Partially
99-026	ND	Partially	Partially	Partially
99-037	No	ND	Yes	Partially
99-045	ND	Partially	ND	No
99-054	Yes	Yes	Mostly	No-but Nearly
99-055	Yes	Yes	Yes	Partially
99-071	NA	Yes	NA	NA
99-100	ND	Yes	ND	No
00-112	ND	Yes	ND	Partially
00-127	ND	Yes	ND	Partially
00-160	Yes	Mostly	Mostly	Partially
00-166	Yes	Mostly	Yes	No-but Nearly
00-168	Yes	ND	Yes	No-but Nearly
01-017	Yes	Yes	Yes	Partially
01-020	Yes	Yes	Yes	Partially
01-135	Yes	Yes	Partially	Barely
02-018	NA	Yes	NA	NA
02-108	NA	Yes	NA	NA
02-109	ND	Yes	ND	Partially

Table 27. Overall compliance questionnaire by mitigation site. For all 79 mitigation sites, each of the success criteria questions below were assigned one of the following answers: Yes, Mostly, Partially, Barely, No-but Nearly or No. For some sites these questions were not relevant (NA). For a full description of these answer these evaluation categories and how they were delineated, see the text.

File #	Site #	Was 401 Compliance Met?	Was Mitigation Plan (All Agencies) Compliance Met?	Is Function Optimal?
91-02	1	Partially	Partially	Partially
92-04	1	Yes	Yes	Partially
92-10	1	Partially	Yes	Partially
92-11	1	Yes	Yes	Partially
93-06	1	Yes	Yes	Partially
93-09	1	Yes	Yes	No-but Nearly
93-09	2	Yes	Yes	Mostly
93-15	1	ND	Yes	No
93-15	4	ND	Yes	No
93-15	3	ND	Partially	Mostly
93-15	2	ND	ND	No
93-19	1	Yes	Yes	Partially
94-03	1	Partially	ND	No
94-03	2	Partially	ND	Partially
94-09	1	Yes	ND	Partially
95-003	1	Yes	Yes	No
95-02	1	Yes	Mostly	Partially
95-02	2	Yes	Partially	No
95-04	1	Mostly	Yes	No
95-062	1	Yes	Mostly	Partially
95-07	1	Partially	Partially	No
95-08	1	Yes	Yes	Partially
95-08	2	Yes	Yes	Partially
95-08	3	Yes	Yes	Barely
95-08	4	Yes	Yes	Partially
95-091	1	Yes	Mostly	No
95-091	2	Yes	Yes	No
95-119	1	Yes	ND	No
95-119	2	No	ND	No
95-119	3	Yes	ND	Partially
96-086	1	Partially	Partially	Partially
96-086	2	Partially	Partially	Partially
96-086	3	Partially	No	Barely
96-102	1	Mostly	ND	Partially
97-080	1	Partially	Yes	Partially
97-088	1	Mostly	Mostly	Barely
97-088	2	Yes	Yes	Partially
97-103	1	Yes	Mostly	No-but Nearly
97-103	2	Yes	Yes	No-but Nearly
97-129	1	Mostly	Yes	No
97-129	3	Barely	No	No
97-133	1	ND	ND	No-but Nearly
97-133	2	ND	ND	No-but Nearly
97-170	1	Yes	Yes	Partially
97-175	1	Yes	Yes	No-but Nearly

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97-203	1	ND	Partially	No
97-203	2	ND	Partially	No
98-015	1	ND	Yes	Yes
98-015	2	ND	Yes	Yes
98-015	3	ND	Yes	Yes
98-018	1	Yes	Mostly	Partially
98-032	1	Yes	Yes	No
98-032	2	Yes	Yes	Barely
98-072	1	Partially	Partially	Barely
98-112	1	Yes	Yes	No-but Nearly
98-112	2	Yes	Yes	No
98-112	3	Yes	Yes	No
98-196	1	Yes	ND	Partially
99-006	1	Yes	Yes	Partially
99-026	1	Partially	Yes	Partially
99-026	2	Partially	Yes	Partially
99-026	3	Barely	No	Partially
99-037	1	ND	Yes	Partially
99-037	2	ND	Yes	Mostly
99-045	1	Partially	ND	No
99-054	1	Yes	Mostly	No-but Nearly
99-055	1	Yes	Yes	Mostly
99-055	2	Yes	Yes	No-but Nearly
99-100	1	Yes	ND	No
00-112	1	Yes	ND	Partially
00-127	1	Yes	ND	Partially
00-160	1	Mostly	Mostly	Partially
00-166	1	Yes	Yes	No-but Nearly
00-166	2	Partially	Yes	No
00-168	1	ND	Yes	No-but Nearly
01-017	1	Yes	Yes	Partially
01-020	1	Yes	Yes	Partially
01-135	1	Yes	Partially	Barely
02-109	1	Yes	ND	Partially

Table 28. Summary of mitigation success by permit file within the answer categories of the above compliance questionnaire (Table 26). Data shown are percentages within each column out of a total number of 50 permit files. The evaluation for 401 conditions was out of 55 files due to the inclusion of the 5 permits which had in-lieu fees paid that couldn't be tracked to specific mitigation projects. Numbers in parentheses are the actual number of sites within each category. For the UCLA-CRAM functional evaluation, success means "optimal wetland condition." For a full description of these answer categories see the text.

Category	Yes	Mostly	Partially	Barely	No (Nearly)	No	Cannot be Determined
Acreage Requirement	46 (23)	Not a category	Not a category	Not a category	Not a category	24 (12)	30 (15)
401 Conditions	60 (33)	11 (6)	18 (10)	0 (0)	0 (0)	0 (0)	11 (6)
Mitigation Plan Conditions	44 (22)	20 (10)	14 (7)	0 (0)	0 (0)	0 (0)	22 (11)
Functional Evaluation	2 (1)	0 (0)	52 (26)	8 (4)	16 (8)	22 (11)	0 (0)

Table 29. Summary of mitigation success by individual mitigation site within the answer categories of the above compliance questionnaire (Table 27). Data shown are from the set of 50 fully assessed permit files, and are percentages out of a total number of 79 individual mitigation sites. Numbers in parentheses are the actual number of sites within each category. For the UCLA-CRAM functional evaluation, success means "optimal wetland condition." See the text for a full description of these answer categories.

Category	Yes	Mostly	Partially	Barely	No (Nearly)	No	Cannot be Determined
401 Conditions	54 (43)	6 (5)	18 (14)	3 (2)	0 (0)	1 (1)	18 (14)
Mitigation Plan Conditions	53 (42)	10 (8)	13 (10)	0 (0)	0 (0)	4 (3)	20 (16)
Functional Evaluation	4 (3)	5 (4)	42 (33)	8 (6)	14 (11)	28 (22)	0 (0)

Table 30. Summary of mitigation success showing the relationship between 401 Permit files that met three success criteria: the acreage requirement, 401 Permit compliance requirement, and the UCLA -CRAM functional evaluation. Grayed area indicates no data.

Acreage Met?	401 Compliance?	Optimal Function?
ND (15)	ND (1)	Marginal to Poor (1)
		Sub-Optimal
		Optimal
	Failure (0)	Marginal to Poor
		Sub-Optimal
		Optimal
	Partial (6)	Marginal to Poor (3)
		Sub-Optimal (3)
		Optimal
	Success (8)	Marginal to Poor (2)
		Sub-Optimal (6)
		Optimal
No (12)	ND (3)	Marginal to Poor (1)
		Sub-Optimal (1)
		Optimal (1)
	Failure (0)	Marginal to Poor
		Sub-Optimal
		Optimal
	Partial (5)	Marginal to Poor (3)
		Sub-Optimal (2)
		Optimal
	Success (4)	Marginal to Poor (1)
		Sub-Optimal (3)
		Optimal
Yes (23)	ND (2)	Marginal to Poor (2)
		Sub-Optimal
		Optimal
	Failure (0)	Marginal to Poor
		Sub-Optimal
		Optimal
	Partial (5)	Marginal to Poor (1)
		Sub-Optimal (4)
		Optimal
	Success (16)	Marginal to Poor (5)
		Sub-Optimal (11)
		Optimal

Table 31. Acreage summary of mitigation success by project type. Most of these project type categories were taken directly from the permit file, though some were modified after visiting the site, namely those with the stated project types: “other,” and “unspecified.” Required mitigation ratios and realized mitigation ratios are included. Numbers in bold indicate reversed mitigation ratios (losses exceed gains).

	Bank/Channel Work	**Crossing/Bridge**	**Filling**	**Flood Control/Drainage**	**Military**	**Pipeline/Utility**	**Residential/Urban Development**	**Restoration**
Impacts (acres)	6.77	9.86	14.10	79.11	6.33	3.84	47.30	1.92
Mitigation required (acres)	14.87	14.66	27.61	56.66	13.74	3.77	646.97	2.34
Mitigation Ratio	2.2 : 1	1.40 : 1	1.96 : 1	**0.72 : 1**	2.17 : 1	**0.98 : 1**	13.33 : 1	1.22 : 1
Acres of mitigation 100% successful by 401 permit conditions	1.39	5.26	43.63	7.08	0.00	7.77	78.21	10.76
Acres of mitigation at least partially successful by 401 permit conditions	1.39	7.28	45.95	32.51	16.10	8.21	87.60	10.76
Acres of mitigation 100% successful by mitigation plan conditions	0.00	0.66	43.63	21.85	6.10	1.35	77.46	8.65
Acres of mitigation at least partially successful by mitigation plan conditions	4.59	7.27	45.95	32.51	6.10	1.35	99.31	8.65
Mitigation Ratio (by 100% successful by 401 permit conditions)	**0.21:1**	**0.53:1**	3.09:1	**0.09:1**	**0.00:1**	2.02:1	1.65:1	5.60:1
Acres of mitigation successful by Total UCLA-CRAM %	0.00	0.00	0.00	7.08	0.00	0.00	0.00	0.00
Acres of mitigation at least partially successful by Total UCLA-CRAM %	4.59	1.36	45.95	28.26	16.10	7.23	84.59	10.76
Mitigation Ratio (by at least partially successful by Total UCLA-CRAM %)	**0.68:1**	**0.14:1**	3.26:1	**0.36:1**	2.54:1	1.88:1	1.79:1	5.60:1

Table 32. Acreage summary of mitigation success by permittee type. These permittee type categories were taken directly from the 401 Permit Files. Required mitigation ratios and realized mitigation ratios are included. Numbers in bold indicate reversed mitigation ratios (losses exceed gains).

	Developer	**Industry**	**Military**	**Municipal**	**Private**	**State/Federal**
Impacts (acres)	60.87	13.51	9.88	74.46	2.88	7.62
Mitigation required (acres)	525.42	26.42	19.84	41.08	146.84	21.02
Mitigation Ratio	8.46:1	1.96:1	2.01:1	**0.55:1**	50.99:1	2.76:1
Acres of mitigation 100% successful by 401 permit conditions	81.44	43.63	2.85	22.68	2.11	1.39
Acres of mitigation at least partially successful by 401 permit conditions	100.53	43.63	20.31	29.70	10.01	5.63
Acres of mitigation 100% successful by mitigation plan conditions	90.38	43.63	8.95	8.18	7.90	0.66
Acres of mitigation at least partially successful by mitigation plan conditions	112.23	43.63	10.30	22.84	11.10	5.63
Mitigation Ratio (by 100% successful by 401 permit conditions)	1.34:1	3.23:1	**0.29:1**	**0.30:1**	**0.73:1**	**0.18:1**
Acres of mitigation optimal (>/=80%) by UCLA-CRAM % total	0.00	0.00	0.00	7.08	0.00	0.00
Acres of mitigation at least sub-optimal (>50%) by UCLA-CRAM total	100.09	43.63	20.31	16.63	13.21	4.87
Mitigation Ratio (by at least sub-optimal by Total UCLA-CRAM %)	1.64:1	3.23:1	2.06:1	**0.22:1**	4.59:1	**0.64:1**

Table 33. Acres of wetland habitat impacted and mitigated for the 50 assessed permit files. Data were summed per file where multiple mitigation sites were present. Zeros indicate that no wetlands were impacted (or mitigated). Asterisks in the "Mitigated" column indicate where mitigation site acreage was estimated.

File #	Impacted	Mitigated
91-02	0.00	0.15*
92-04	0.90	0.84
92-10	0.00	0.00
92-11	0.00	0.34*
93-06	0.00	3.46
93-09	1.45	7.70
93-15	1.60	1.32
93-19	28.08	18.54
94-03	0.00	0.08*
94-09	0.00	0.00
95-003	0.00	0.26
95-02	0.00	0.01
95-04	0.00	0.07
95-062	0.00	0.03
95-07	0.00	0.00
95-08	3.60	9.96
95-091	0.95	0.00
95-119	1.04	0.21
96-086	0.00	0.00
96-102	3.58	9.50
97-080	0.08	2.37
97-088	0.52	0.00
97-103	0.00	1.03*
97-129	0.00	0.00
97-133	0.19	1.03*
97-170	0.00	0.00
97-175	0.69	0.00
97-203	0.00	0.00
98-015	1.65	0.26
98-018	0.06	0.26
98-032	0.21	0.16
98-072	0.07	0.00
98-112	0.00	0.00
98-196	1.37	5.49
99-006	10.94	17.60
99-026	0.00	0.00
99-037	1.87	1.22
99-045	0.00	1.00*
99-054	0.40	0.00
99-055	1.65	4.69
99-100	0.02	0.00
00-112	0.00	0.00
00-127	0.97	2.7*
00-160	0.00	0.00
00-166	0.00	0.03
00-168	0.00	2.81
01-017	0.12	0.21
01-020	0.00	0.00
01-135	0.00	0.00
02-109	0.41	1.11*

Table 34. A master summary of functional assessment data. The data are reported as percentages of the points possible in all metrics except for the Overall Services Gained-Lost data which are the sums of units gained-lost across the seven services categories (Flood Storage, Flood Energy Dissipation, Groundwater Recharge, Biogeochemistry, Sediment Accumulation, Wildlife Habitat, Aquatic Habitat).

File #	Mitigation Site #	UCLA-CRAM	WEA	Supplemental Qualitative Assessment (selected metrics)				Percent Waters of the US	Percent Non-Waters of the US	Wetland Indicators			Overall Services Gained-Lost
				Overall Quality of Habitat	Overall Success in Functional Replacement	Overall Success in Achieving Stated Goals of Mitigation Plan/401 Permit Requirements	Appropriateness of Approved 401 Permit Conditions			Overall Hydrology Indicator Score	Overall Soil Indicator Score	Overall Vegetation Indicator Score	
91-02	1	66.6	75.3	66.7	16.7	50	75.0	100	0	66.7	66.7	83.3	-5
92-04	1	65.6	63.0	83.3	91.7	100	83.3	75	25	83.3	75.0	91.7	14
92-10	1	65.7	66.0	75.0	66.7	66.7	33.3	90	10	83.3	83.3	91.7	-5
92-11	1	72.4	75.5	75.0	91.7	91.7	58.3	100	0	83.3	66.7	100	2
93-06	1	70.5	85.1	83.3	100	91.7	100	70	30	91.7	66.7	91.7	0
93-09	1	52.4	54.4	66.7	41.7	41.7	41.7	1	99	8.3	16.7	33.3	-38
93-09	2	79.0	76.7	83.3	100	100	100	90	10	83.3	83.3	100	-10
93-15	1	45.8	69.3	75.0	91.7	58.3	91.7	80	20	75.0	75.0	91.7	-3
93-15	2	19.6	41.3	8.3	8.3	75.0	25.0	0	0	8.3	8.3	8.3	-46
93-15	3	75.8	95.3	100	8.3	91.7	8.3	10	90	100	16.7	41.7	0
93-15	4	31.2	78.7	58.3	25.0	91.7	25.0	0	100	16.7	8.3	16.7	-41
93-19	1	60.7	70.5	91.7	91.7	100	83.3	80	20	91.7	91.7	100	6
94-03	1	32.5	24.7	16.7	25.0	8.3	41.7	100	0	91.7	75.0	58.3	-4
94-03	2	64.6	89.5	75.0	66.7	50	41.7	100	0	91.7	83.3	91.7	0
94-09	1	62.6	51.2	33.3	83.3	50	66.7	90	10	33.3	33.3	33.3	0
95-003	1	41.7	60.5	58.3	66.7	41.7	83.3	10	90	41.7	33.3	50	-1
95-02	1	67.2	52.7	91.7	8.3	16.7	8.3	0	100	8.3	8.3	8.3	-17
95-02	2	45.6	63.0	25.0	25.0	8.3	8.3	25	75	50	50	50	-17
95-04	1	46.1	45.1	41.7	25.0	66.7	58.3	30	70	50	33.3	58.3	-6
95-062	1	69.2	75.8	58.3	25.0	58.3	58.3	5	95	16.7	25.0	33.3	-12
95-07	1	33.3	36.7	16.7	50	16.7	41.7	100	0	50	25.0	16.7	-2
95-08	1	61.0	68.5	83.3	91.7	83.3	83.3	75	25	75.0	75.0	83.3	13
95-08	2	61.7	68.0	75.0	75.0	83.3	83.3	30	70	58.3	58.3	75.0	-9
95-08	3	58.0	73.0	83.3	8.3	8.3	8.3	10	90	8.3	8.3	25.0	-40
95-08	4	63.4	74.7	91.7	41.7	16.7	16.7	20	80	50	50	66.7	-33
95-091	1	21.2	27.5	8.3	8.3	16.7	25.0	60	40	58.3	16.7	16.7	-34
95-091	2	18.8	28.7	25.0	41.7	66.7	41.7	0	100	16.7	16.7	16.7	-35
95-119	1	47.1	53.9	75.0	83.3	100	75.0	90	10	91.7	91.7	91.7	20
95-119	2	32.7	15.0	8.3	8.3	25.0	75.0	70	30	58.3	8.3	16.7	-19
95-119	3	60.9	59.2	41.7	41.7	41.7	66.7	15	85	50	25.0	50	-24
96-086	1	63.2	65.9	66.7	66.7	41.7	91.7	30	70	50	33.3	50	-9
96-086	2	59.4	60.9	41.7	16.7	91.7	16.7	0	100	33.3	8.3	25.0	-19
96-086	3	58.0	64.8	8.3	41.7	16.7	58.3	100	0	83.3	83.3	58.3	-1
96-102	1	65.6	60.7	83.3	100	91.7	100	95	5	91.7	83.3	91.7	26
97-080	1	65.2	78.1	75.0	83.3	91.7	91.7	40	60	66.7	66.7	75.0	13

Table continues on next page…

File #	Mitigation Site #	UCLA-CRAM	WEA	Supplemental Qualitative Assessment (selected metrics)				Percent Waters of the US	Percent Non-Waters of the US	Wetland Indicators			Overall Services Gained-Lost
				Overall Quality of Habitat	Overall Success in Functional Replacement	Overall Success in Achieving Stated Goals of Mitigation Plan/401 Permit Requirements	Appropriateness of Approved 401 Permit Conditions			Overall Hydrology Indicator Score	Overall Soil Indicator Score	Overall Vegetation Indicator Score	
97-088	1	58.5	64.8	83.3	50	91.7	58.3	0	100	16.7	8.3	25.0	-2
97-088	2	68.6	72.5	91.7	25.0	91.7	16.7	0	100	25.0	8.3	33.3	-2
97-103	1	51.0	44.5	33.3	50	100	33.3	75	25	16.7	8.3	41.7	0
97-103	2	52.9	50	75.0	50	100	33.3	40	60	41.7	25.0	50	3
97-129	1	34.5	59.7	58.3	75.0	83.3	83.3	20	80	41.7	41.7	83.3	2
97-129	3	16.7	28.5	8.3	8.3	8.3	16.7	0	100	8.3	8.3	8.3	-15
97-133	1	51.0	44.5	33.3	50	100	33.3	75	25	16.7	8.3	41.7	-20
97-133	2	52.9	50	75.0	50	100	33.3	40	60	41.7	25.0	50	-21
97-170	1	60.6	65.3	50	91.7	58.3	58.3	90	10	66.7	41.7	100	-2
97-175	1	52.4	60.9	41.7	41.7	83.3	33.3	0	100	8.3	8.3	66.7	-1
97-203	1	27.8	51.5	16.7	16.7	16.7	25.0	10	90	8.3	8.3	33.3	-14
97-203	2	33.7	48.7	25.0	25.0	16.7	25.0	10	90	8.3	8.3	33.3	-15
98-015	1	84.4	79.7	75.0	91.7	100	91.7	0	100	8.3	8.3	33.3	0
98-015	2	80.7	76.3	83.3	41.7	100	66.7	100	0	75.0	58.3	66.7	-7
98-015	3	84.4	78.5	66.7	58.3	16.7	50	60	40	58.3	50	100	-10
98-018	1	65.4	61.8	58.3	41.7	50	50	15	85	41.7	41.7	66.7	-14
98-032	1	40.7	43.3	50	41.7	66.7	41.7	90	10	91.7	91.7	100	-11
98-032	2	54.6	66.0	41.7	58.3	58.3	75.0	20	80	41.7	41.7	75.0	-22
98-072	1	57.1	54.7	16.7	16.7	25.0	66.7	50	50	41.7	41.7	41.7	-19
98-112	1	50.6	56.5	33.3	33.3	91.7	33.3	0	100	16.7	8.3	25.0	-9
98-112	2	48.6	65.5	83.3	66.7	91.7	75.0	20	80	50	25.0	66.7	-14
98-112	3	48.9	44.3	41.7	16.7	91.7	16.7	0	100	8.3	8.3	16.7	-19
98-196	1	71.4	63.7	83.3	100	83.3	100	90	10	91.7	83.3	91.7	25
99-006	1	70.2	66.7	83.3	100	100	100	100	0	91.7	91.7	58.3	17
99-026	1	69.2	65.5	75.0	41.7	91.7	41.7	100	0	50	25.0	100	-9
99-026	2	72.1	62.2	66.7	41.7	91.7	41.7	100	0	50	25.0	83.3	1
99-026	3	66.0	66.7	75.0	41.7	16.7	41.7	100	0	50	25.0	100	-10
99-037	1	69.1	77.9	58.3	50	83.3	41.7	60	40	75.0	50	75.0	13
99-037	2	75.9	77.9	75.0	33.3	83.3	58.3	50	50	41.7	16.7	66.7	-2
99-045	1	43.8	59.2	50	33.3	66.7	66.7	60	40	75.0	66.7	91.7	2
99-054	1	51.4	53.3	41.7	50	83.3	50	70	30	25.0	16.7	66.7	-22
99-055	1	74.5	85.8	83.3	91.7	100	91.7	85	15	91.7	91.7	75.0	19
99-055	2	53.9	66.8	25.0	25.0	33.3	91.7	5	95	8.3	8.3	41.7	-7
99-100	1	41.3	63.2	41.7	16.7	16.7	41.7	0	100	8.3	8.3	58.3	-15
00-112	1	73.0	77.3	83.3	100	100	100	50	50	25.0	16.7	33.3	23
00-127	1	71.4	63.7	83.3	100	83.3	100	90	10	91.7	83.3	91.7	28
00-160	1	61.9	65.8	58.3	75.0	91.7	75.0	30	70	58.3	50	66.7	-7
00-166	1	50	59.8	91.7	91.7	100	100	5	95	41.7	41.7	66.7	12
00-166	2	43.3	50.2	41.7	41.7	50	75.0	0	100	16.7	16.7	33.3	-6
00-168	1	53.7	64.8	75.0	83.3	91.7	91.7	75	25	83.3	83.3	100	-2
01-017	1	71.4	80.3	83.3	91.7	100	91.7	50	50	58.3	50	91.7	12
01-020	1	65.6	74.2	33.3	100	100	83.3	100	0	58.3	33.3	25.0	0
01-135	1	57.1	54.9	50	16.7	16.7	16.7	100	0	41.7	33.3	83.3	-3
02-109	1	71.4	63.7	83.3	100	83.3	100	90	10	91.7	83.3	91.7	28

9. Figures

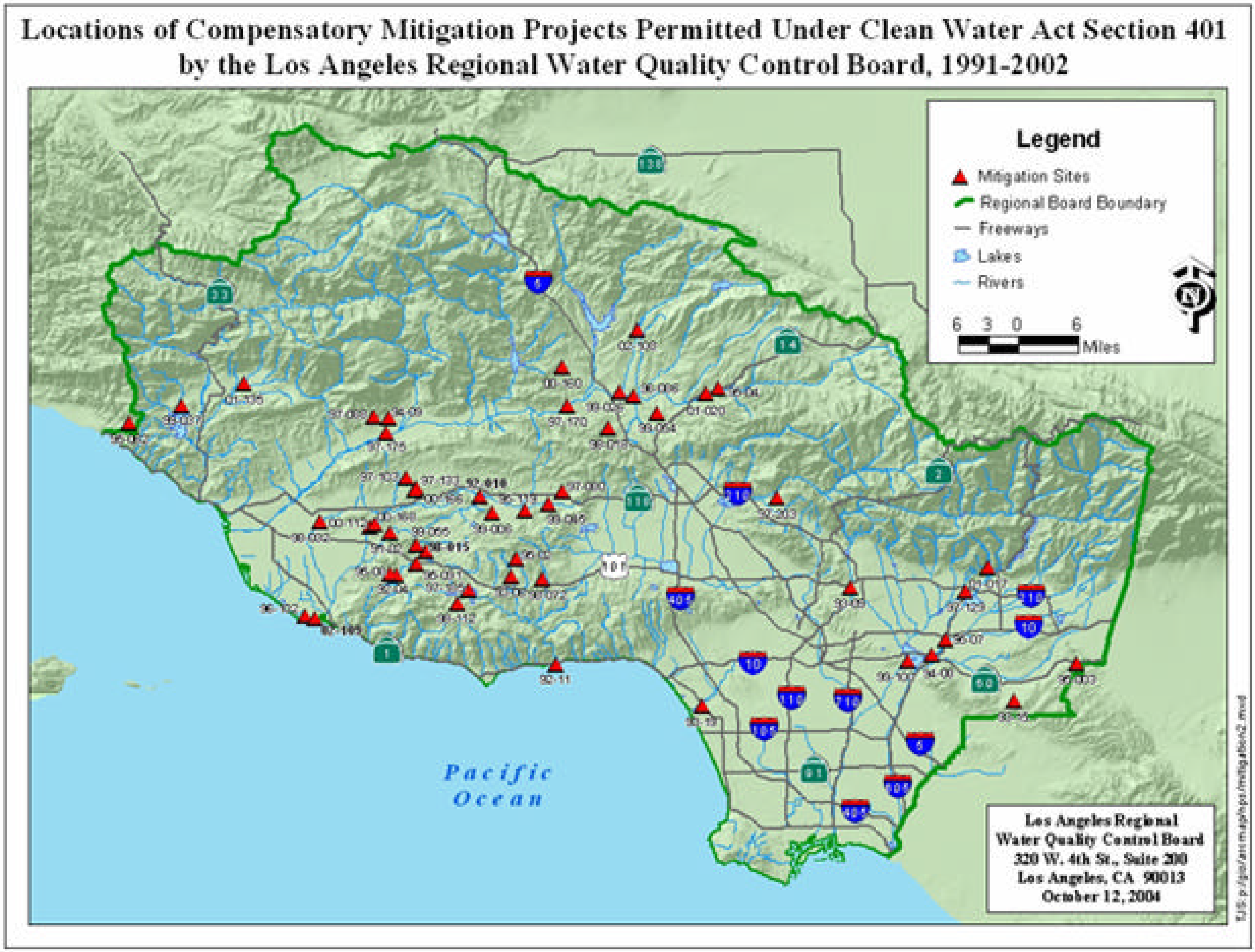

Figure 1. Map of LARWQCB's region showing the locations of the mitigation sites.

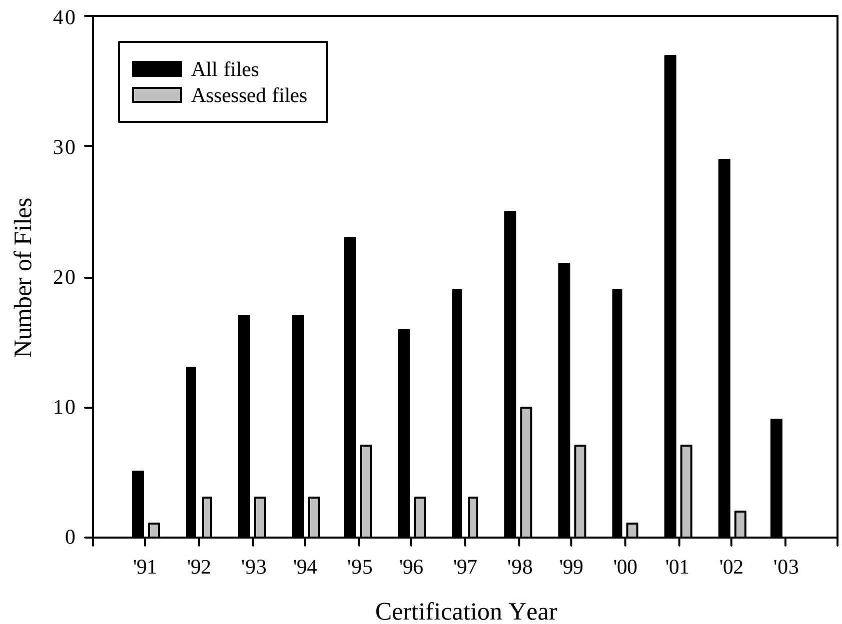

Figure 2. 401 Permit File Review Analysis showing the number of files certified in each year sampled for all files reviewed (N=250) and the subset of files evaluated fully (N=50).

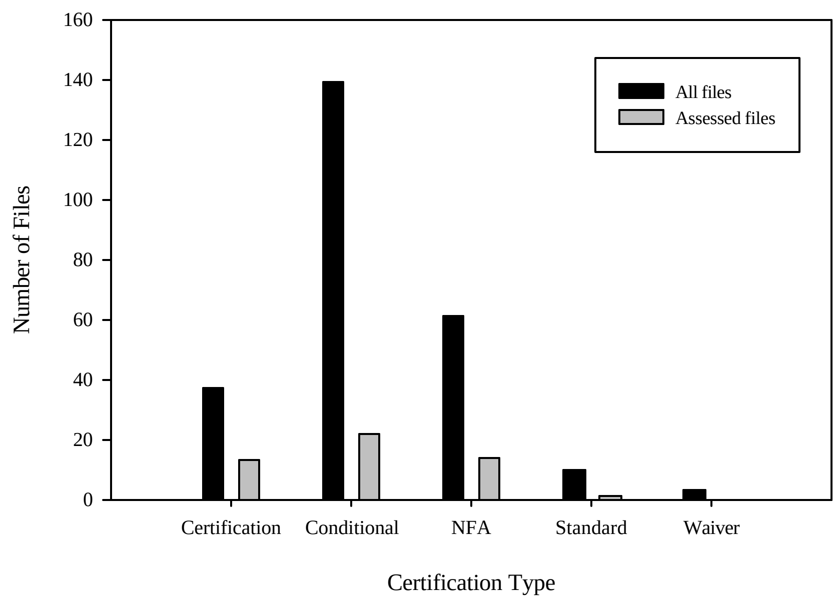

Figure 3. 401 Permit File Review Analysis showing the number of files in each certification category for all files reviewed (N=250) and the files evaluated fully (N=50).

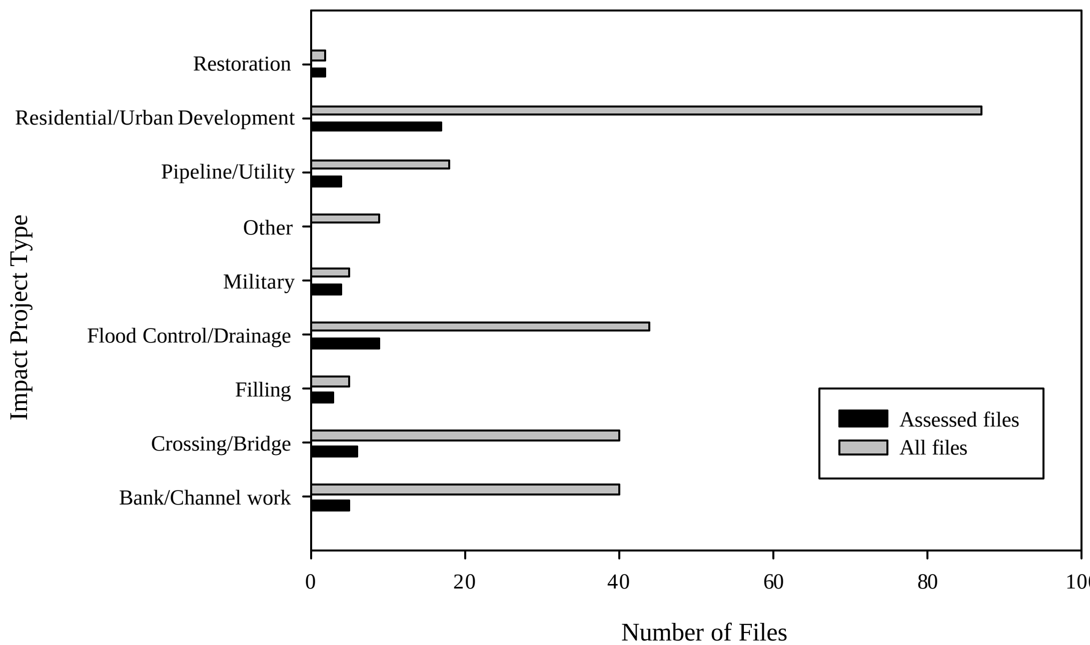

Figure 4. 401 Permit File Review Analysis showing the number of files in each impact project category for all files reviewed (N=250) and the files evaluated fully (N=50).

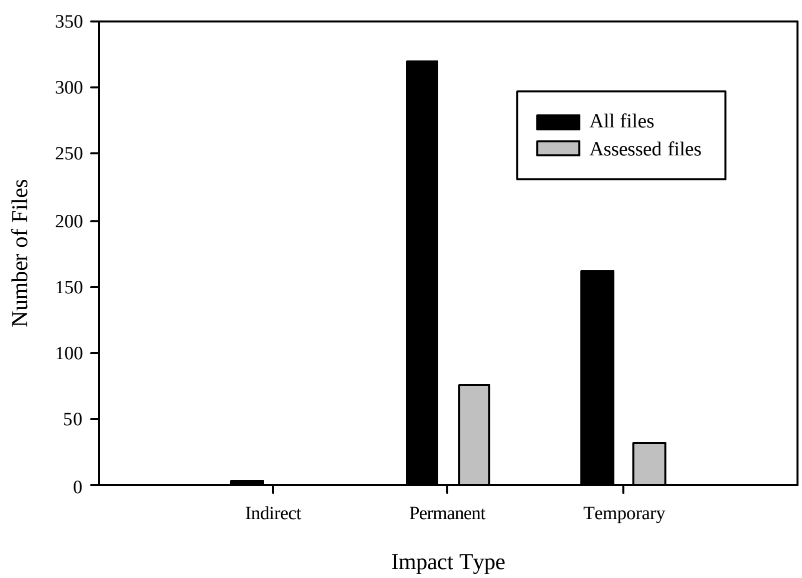

Figure 5. Number of files involving each type of impact in the entire set of files evaluated (485 impacts among 250 files) and in the subset of files assessed fully (109 impacts among 50 files).

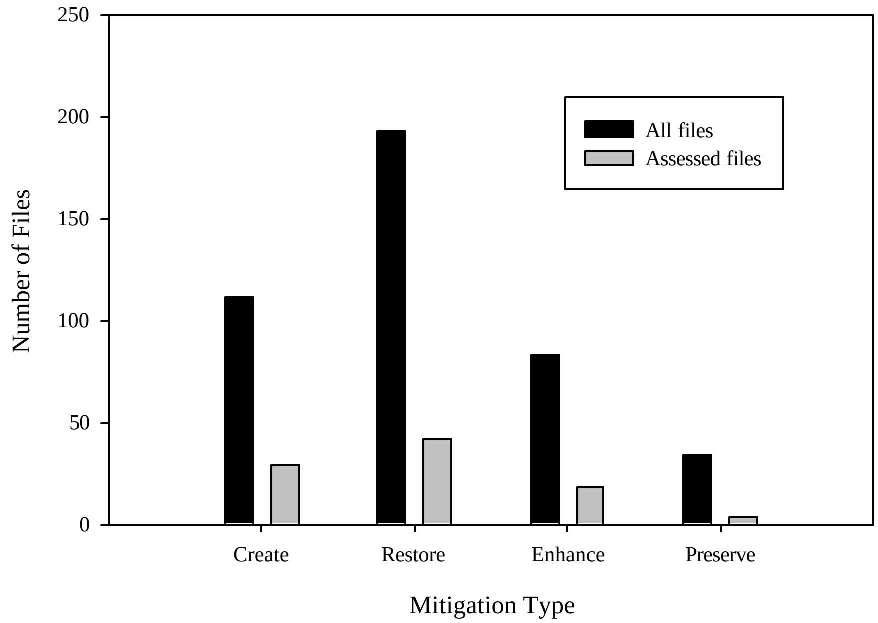

Figure 6. 401 Permit File Review Analysis showing the number of files in each mitigation category for all files reviewed (422 mitigations among 250 files) and the files evaluated fully (93 mitigations among 50 files).

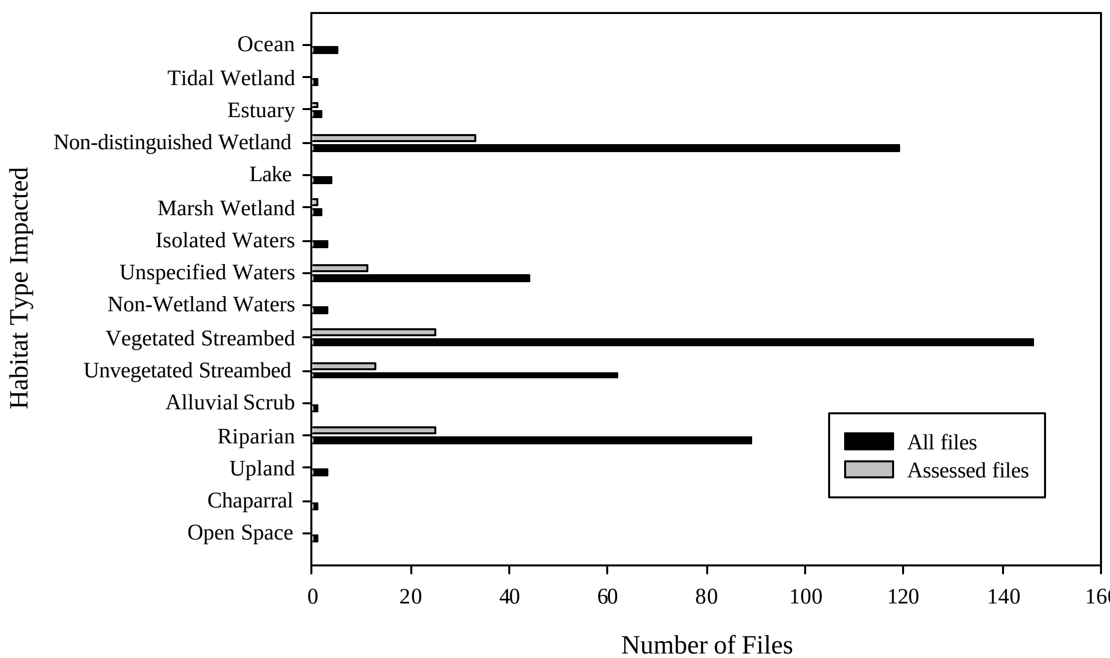

Figure 7. 401 Permit File Review Analysis showing the number of files involving impacts to each habitat type for all files reviewed (486 habitat impacts among 250 files) and the files evaluated fully (109 habitat impacts among 50 files).

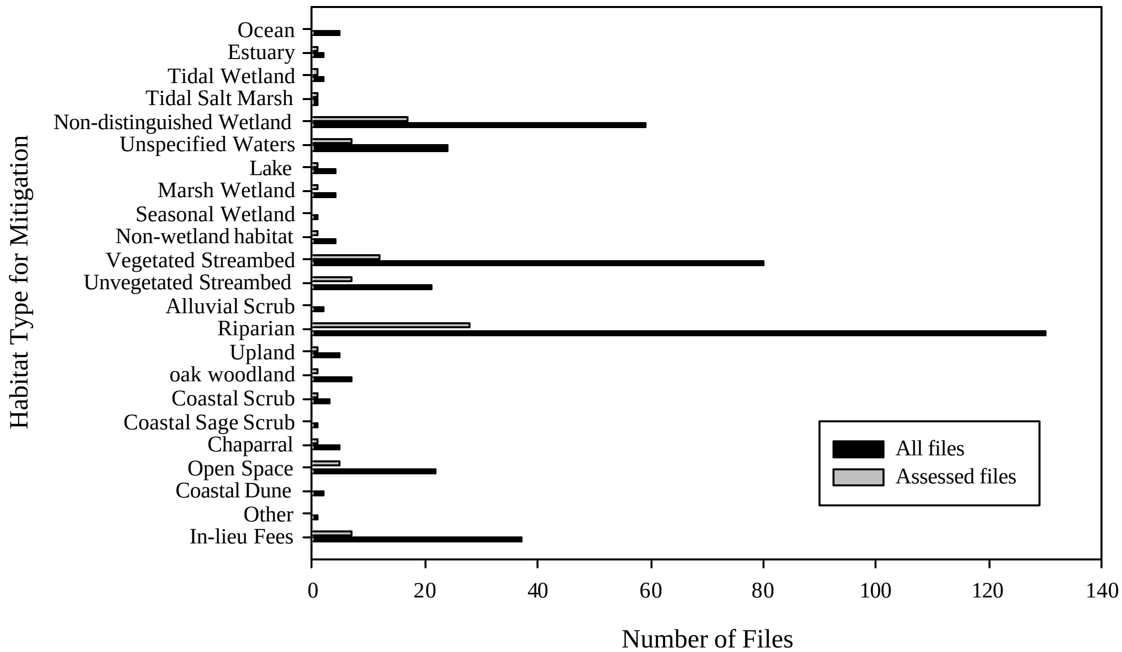

Figure 8. 401 Permit File Review Analysis showing the number of files involving mitigation to each habitat type for all files reviewed (422 habitats mitigated among 248 files) and the files evaluated fully (93 habitats mitigated among 50 files).

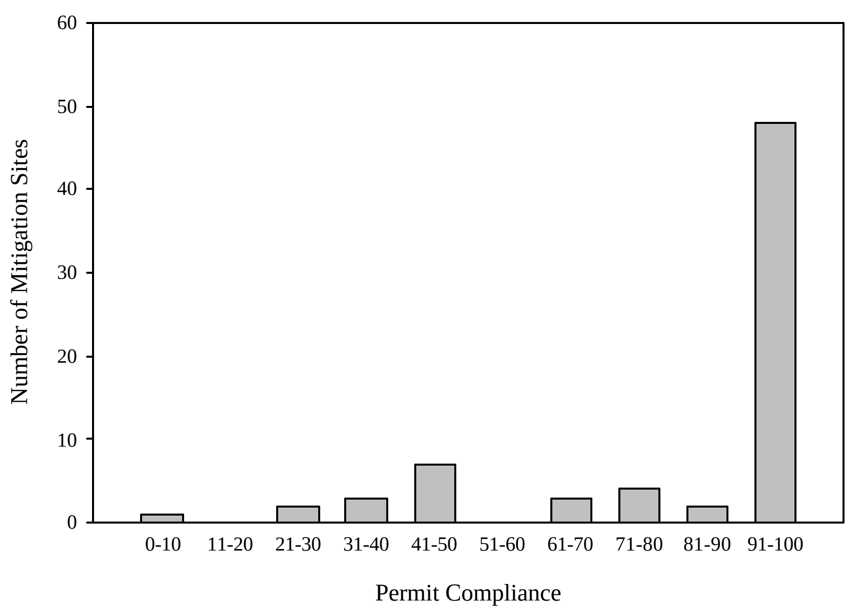

Figure 9. 401 Permit Compliance histogram showing the percent of 401 Permit Conditions met for all of the files in the subset of fifty files evaluated fully and the five in-lieu fee files for which compliance could be determined ((N= 70 mitigation sites within 49 files). Fifteen sites did not have assessable permit conditions, therefore compliance was not calculated for them.

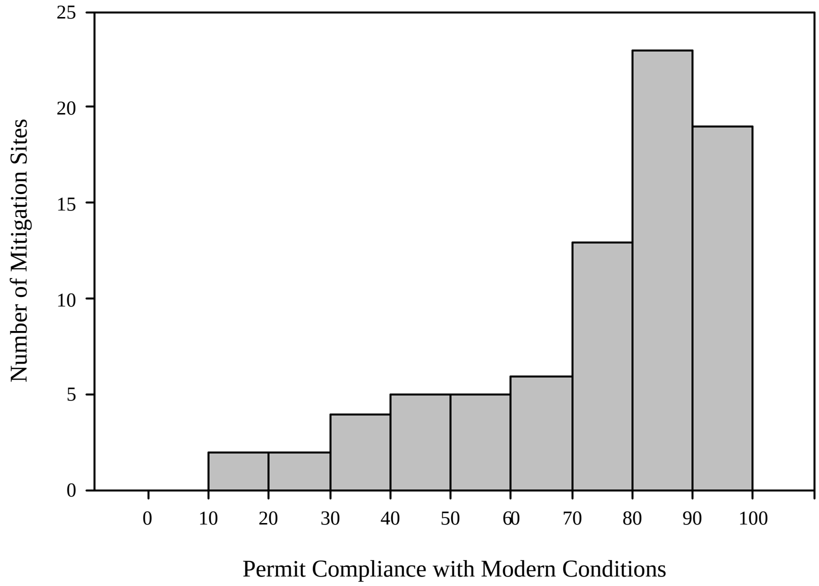

Figure 10. 401 Permit Compliance with Modern Conditions histogram showing the percent of Modern 401 Permit Conditions met for all of the files in the subset of fifty files evaluated fully (N= 79 mitigation sites within 50 files).

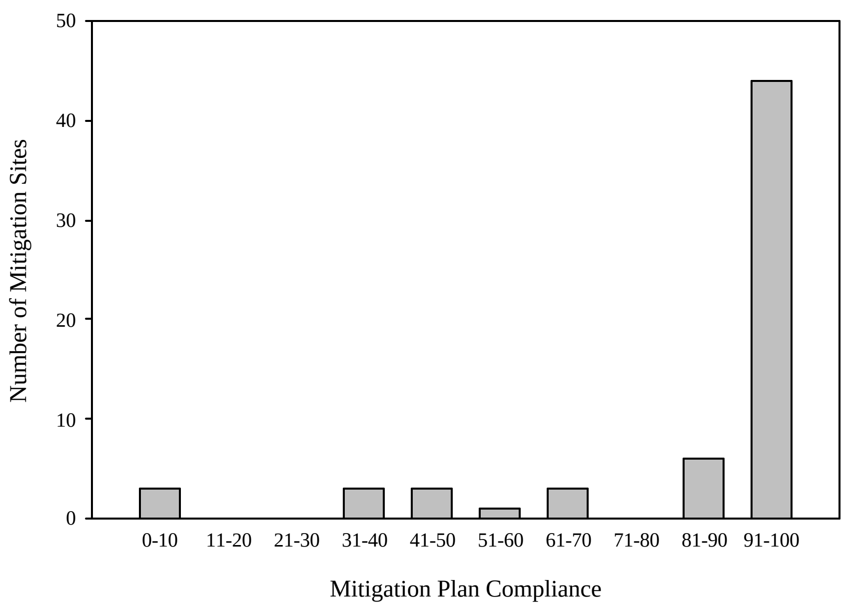

Figure 11. Mitigation Plan Compliance histogram showing the percent of Mitigation Plan conditions met for the files in the subset of files evaluated fully that had Mitigation Plans (N=63 mitigation sites within 38 files).

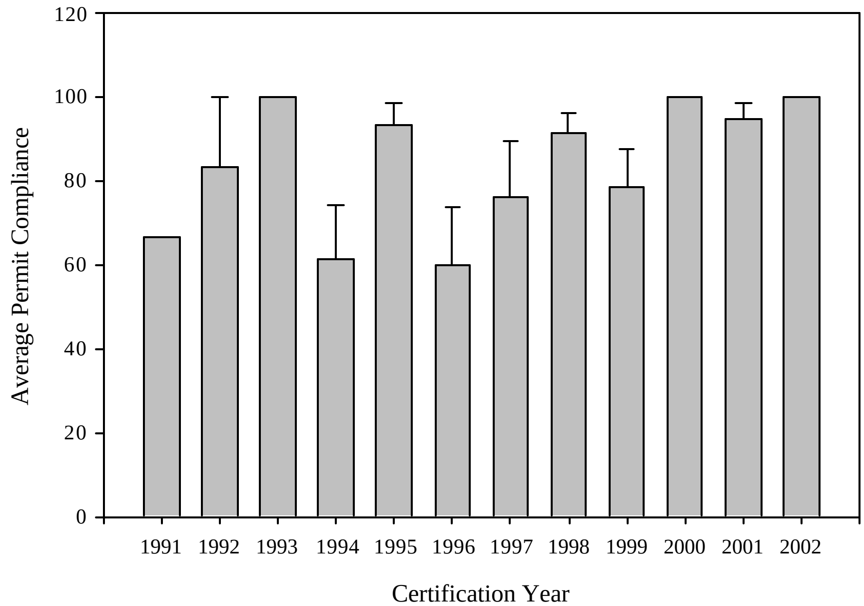

Figure 12. Average 401 Permit Compliance grouped by the year in which 401 Permit was issued (N=70 mitigation sites within 49 files). The error bars represent standard errors of means.

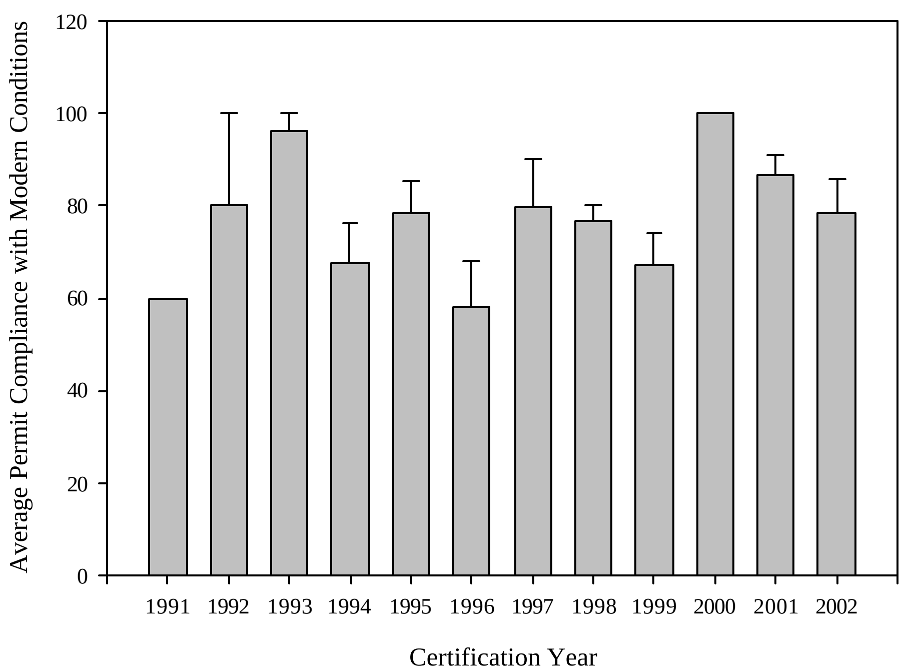

Figure 13. Average 401 Permit Compliance with Modern Conditions grouped by certification year (N=79 mitigation sites within 50 files). The error bars represent standard errors.

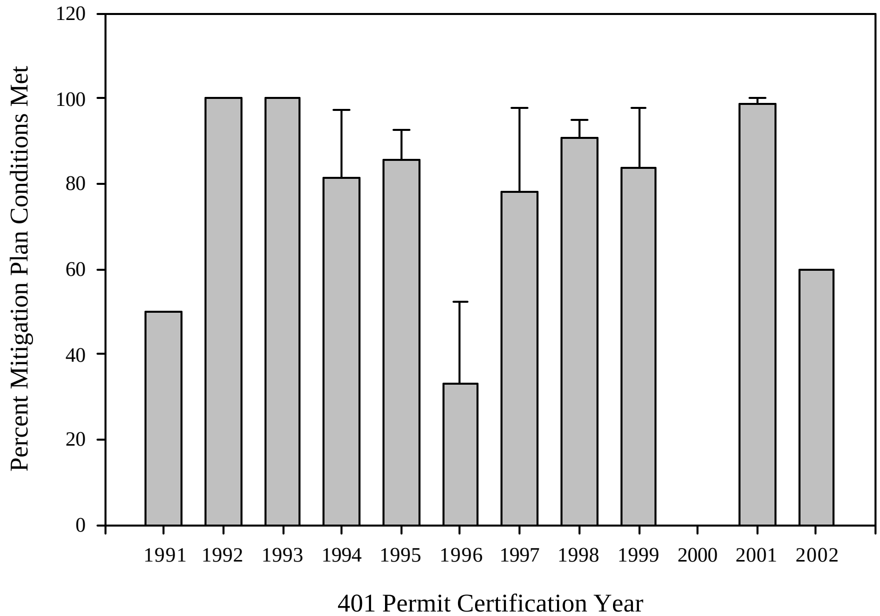

Figure 14. Average Mitigation Plan Compliance grouped by the year in which the 401 Permits were issued (N=79 mitigation sites within 50 files). The error bars represent standard errors.

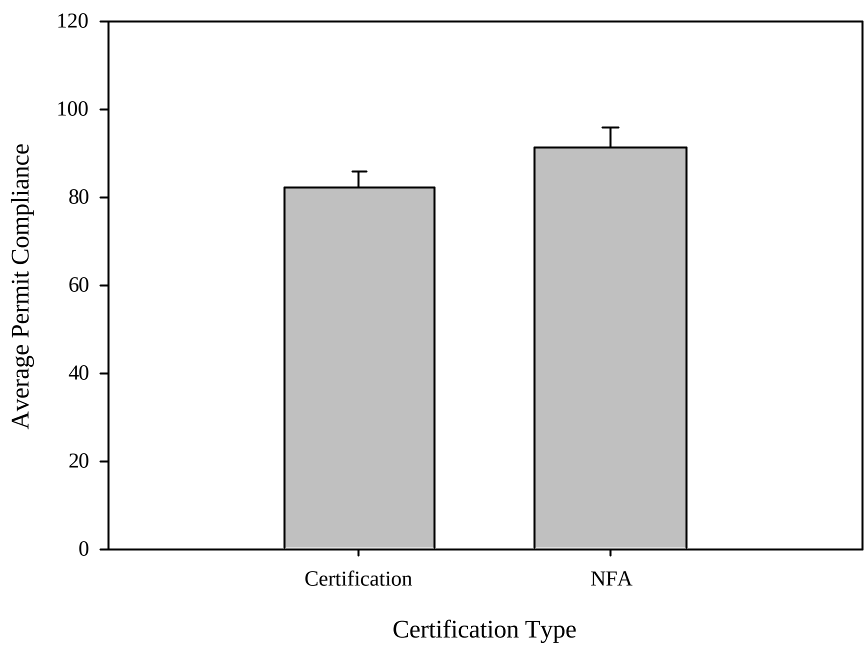

Figure 15. Average 401 Permit Compliance grouped by type of 401 Permit Certification (N=79 mitigation sites within 50 files). The error bars represent standard errors.

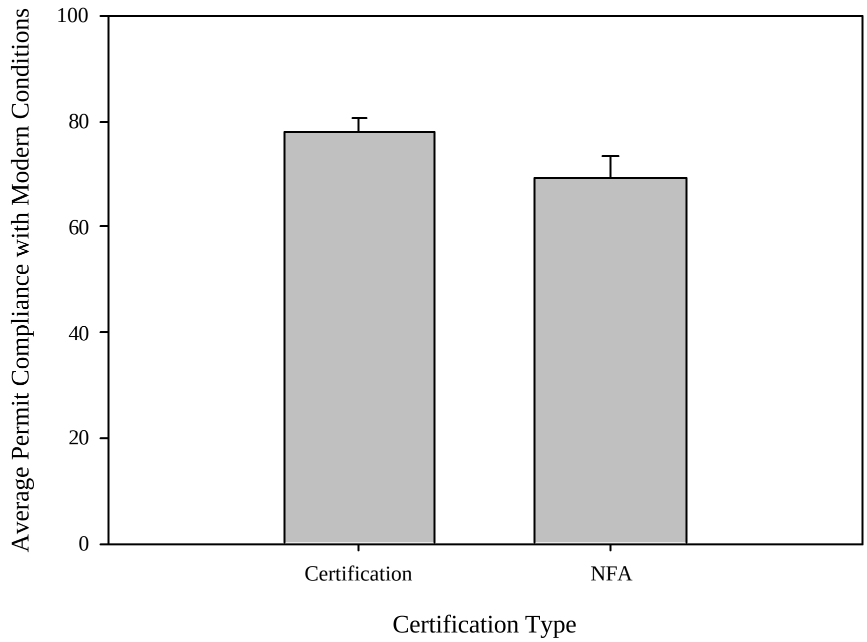

Figure 16. Average 401 Permit Compliance with Modern Conditions grouped by type of 401 permit certification (N=79 mitigation sites within 50 files). The error bars represent standard errors.

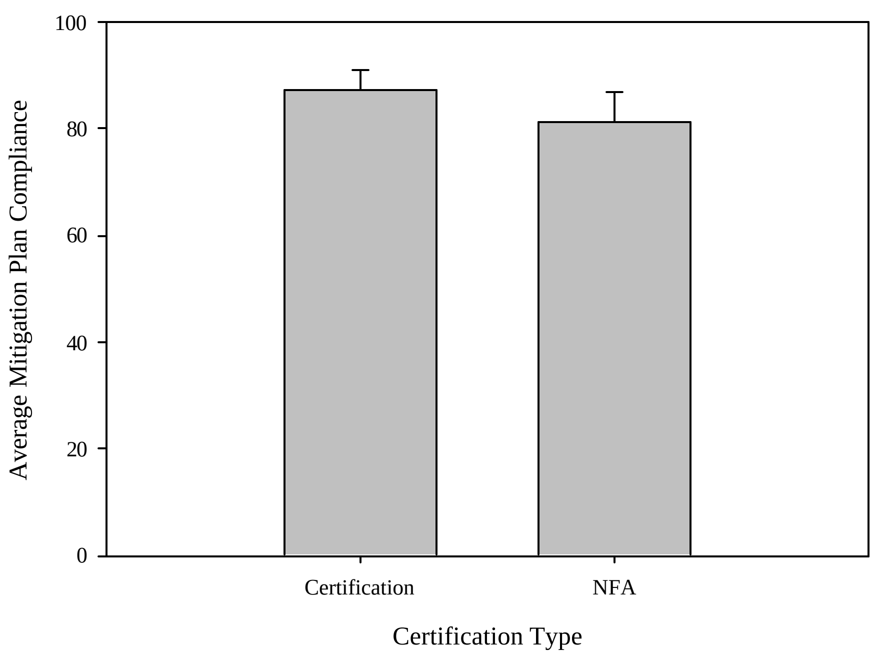

Figure 17. Average Mitigation Plan Compliance grouped by type of permit (N=70 mitigation sites within 50 files). The error bars represent standard errors.

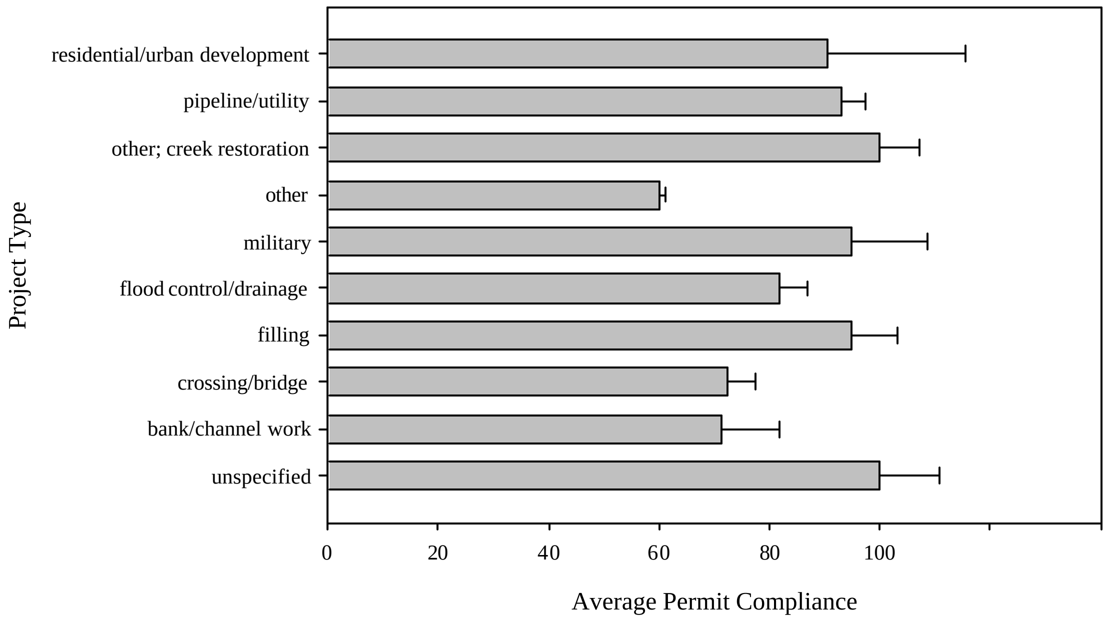

Figure 18. Average 401 Permit Compliance grouped by type of impact project (N=79 mitigation sites within 50 files). The error bars represent standard errors.

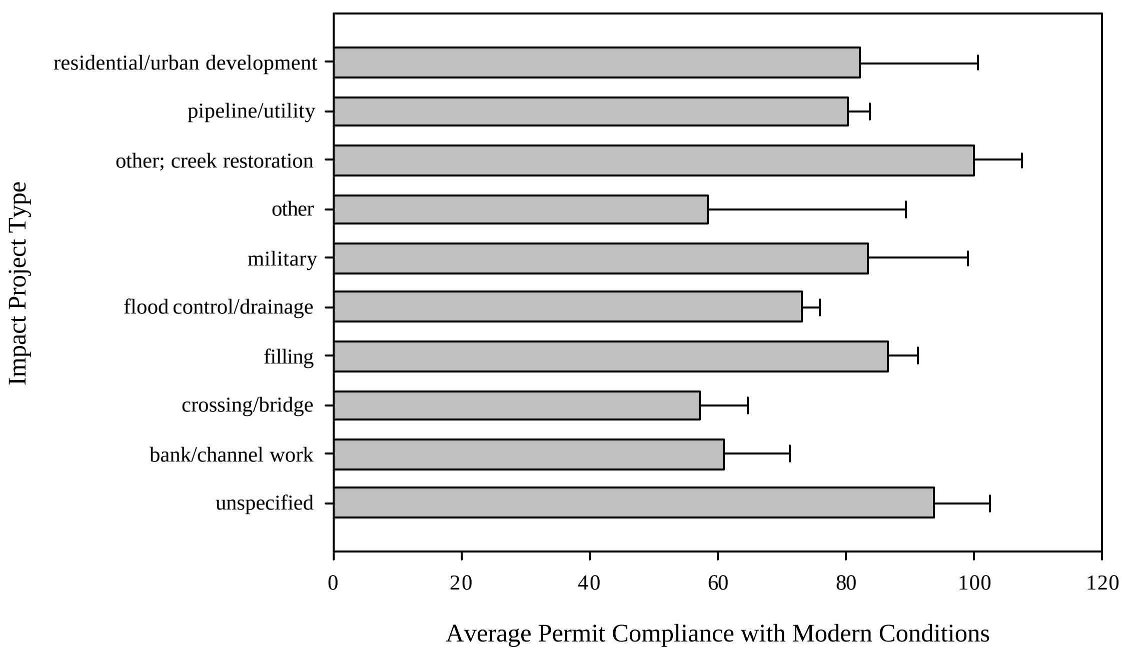

Figure 19. Average 401 Permit Compliance with Modern Conditions by type of impact project (N=79 mitigation sites within 50 files). The error bars represent standard errors.

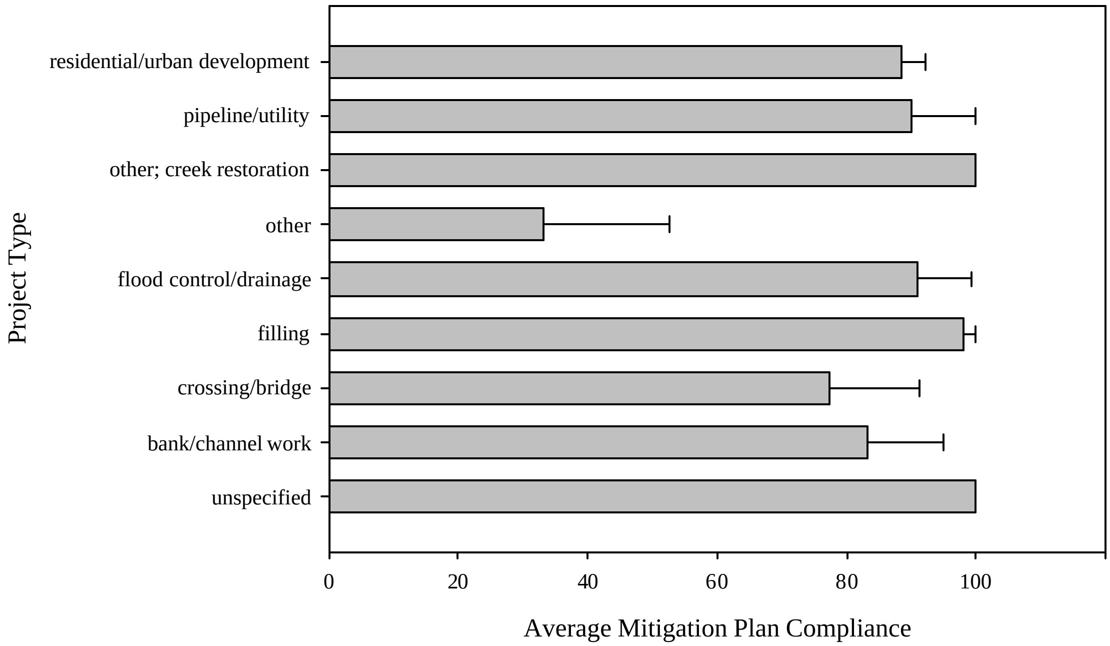

Figure 20. Average Mitigation Plan Compliance grouped by type of impact project (N=79 mitigation sites within 50 files). The error bars represent standard errors.

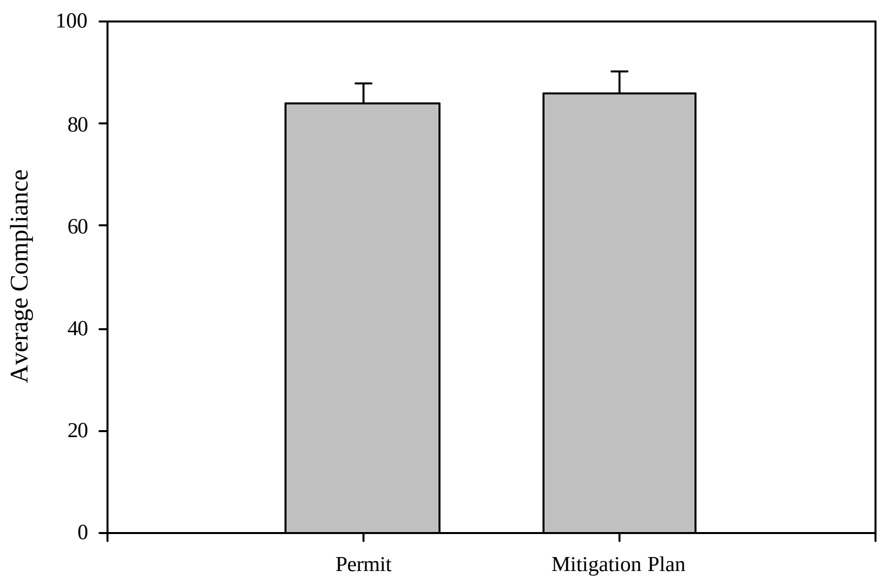

Figure 21. Permit and Mitigation Plan Compliance (N=70 mitigation sites within 49 files and N=63 mitigation sites within 38 files). The error bars represent standard errors.

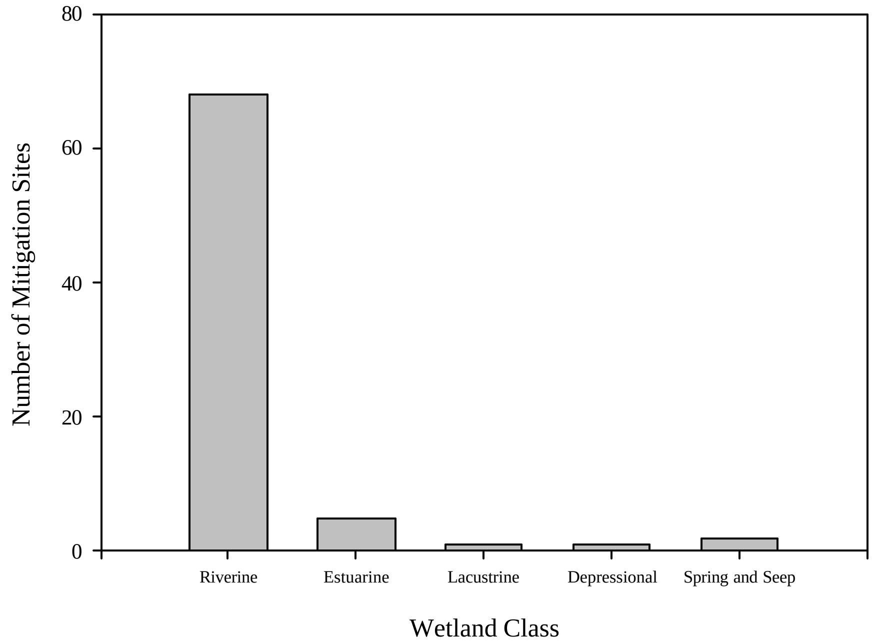

Figure 22. Breakdown of wetland hydrogeomorphic classes as defined and assessed by the CRAM and the corresponding UCLA-CRAM functional evaluations.

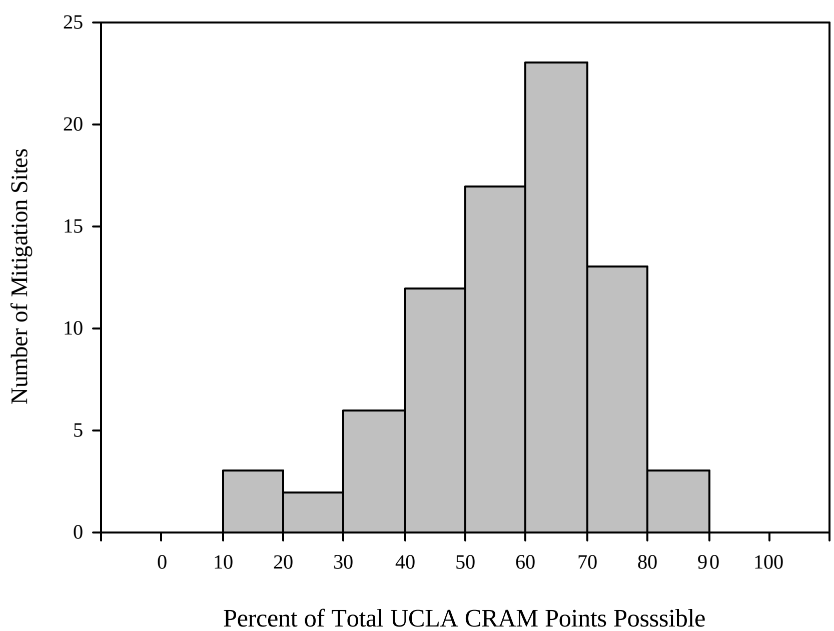

Figure 23. UCLA-CRAM Totals – All Data. All data combined into a single functional success score for each of the 79 individual mitigation sites representing 50 files.

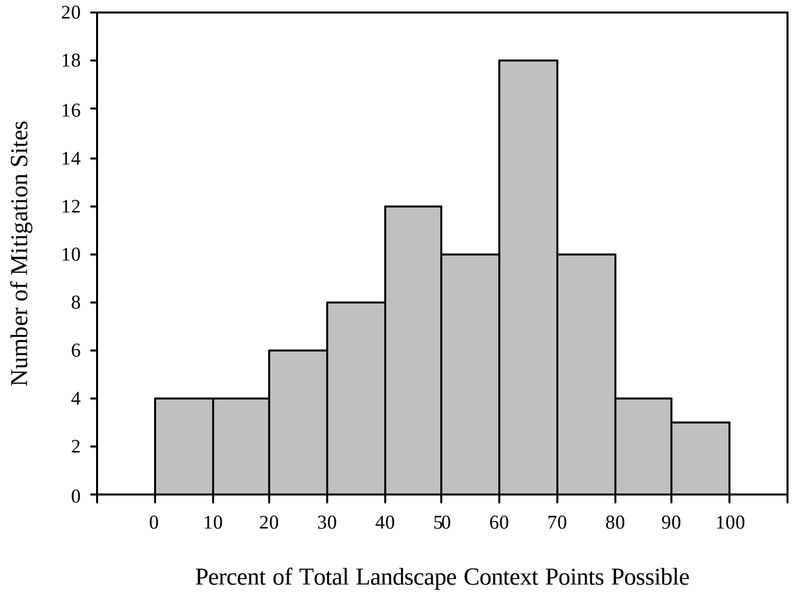

Figure 24. UCLA CRAM Totals – Landscape Context. All buffer extent, buffer width, buffer condition, and linear contiguity data combined into a single landscape context score for each of the 79 individual mitigation sites representing 50 files.

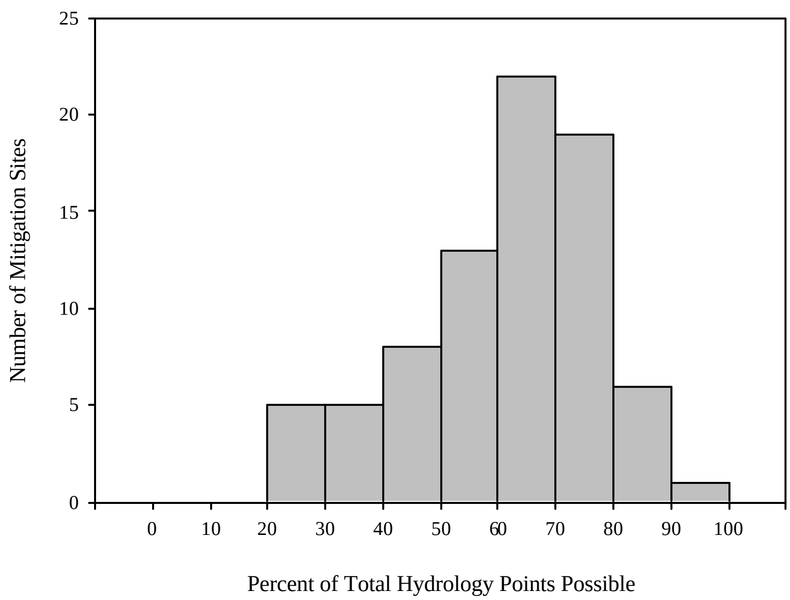

Figure 25. UCLA CRAM Totals – Hydrology. All water source, hydroperiod, and upland connection data combined into a single hydrology score for each of the 79 individual mitigation sites representing 50 files.

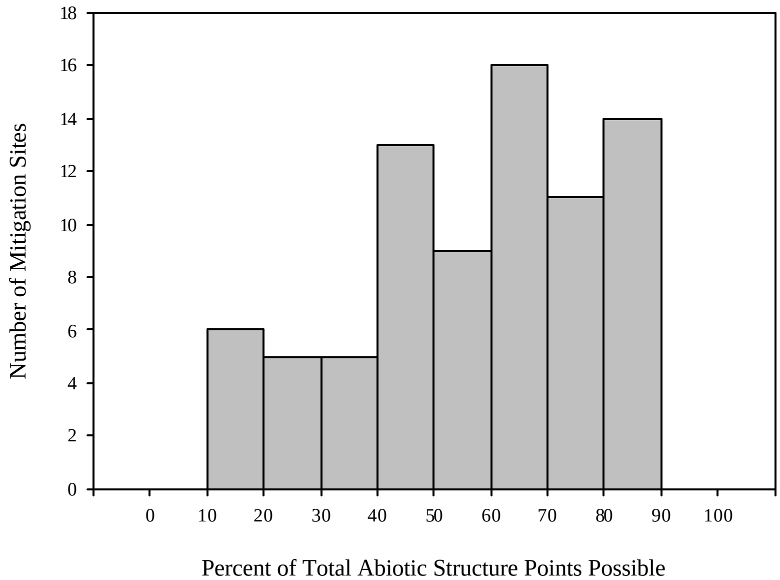

Figure 26. UCLA-CRAM Totals – Abiotic Structure. All abiotic patch richness, topographic complexity, and sediment integrity data combined into a single abiotic structure score for each of the 79 individual mitigation sites representing 50 files.

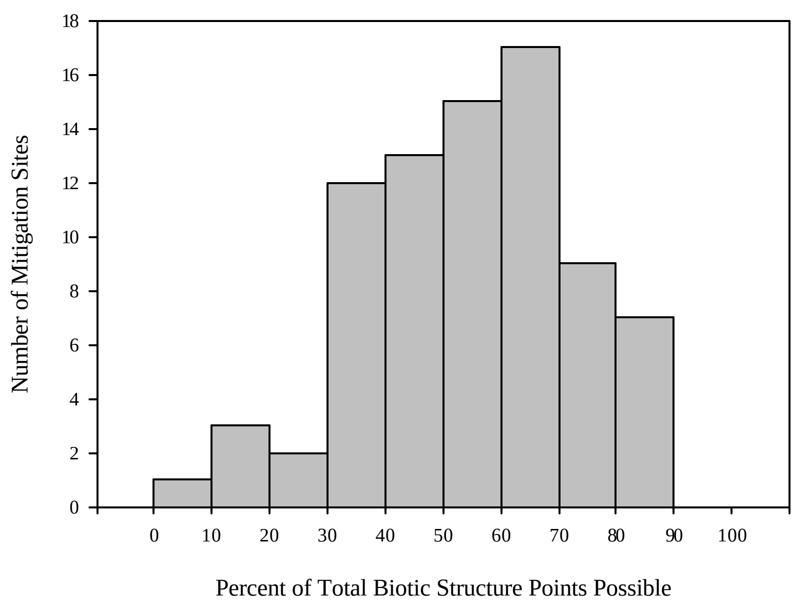

Figure 27. UCLA-CRAM Totals – Biotic Structure. All organic material accumulation, biotic patch richness, vertical structure, interspersion and zonation, and plant community integrity data combined into a single biotic structure score for each of the 79 individual mitigation sites representing 50 files.

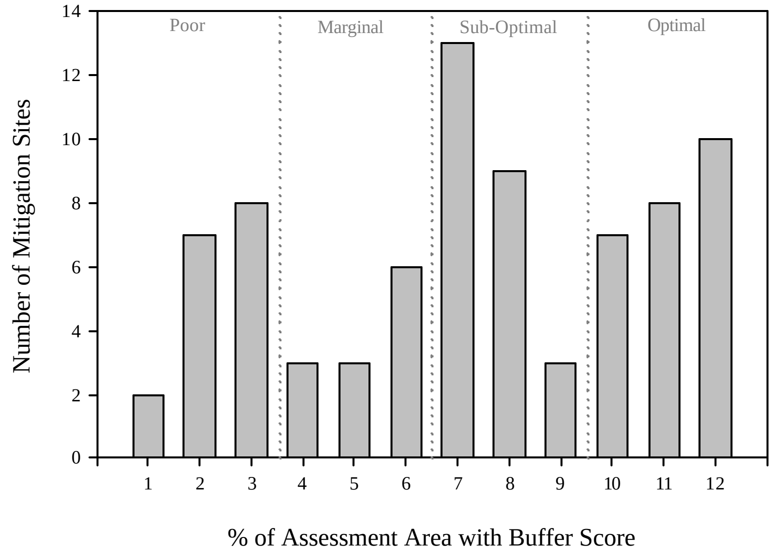

Figure 28. Percent of Assessment Area with Buffer scores. Results from UCLA-CRAM functional assessment for 50 permit files consisting of 79 individual mitigation site evaluations.

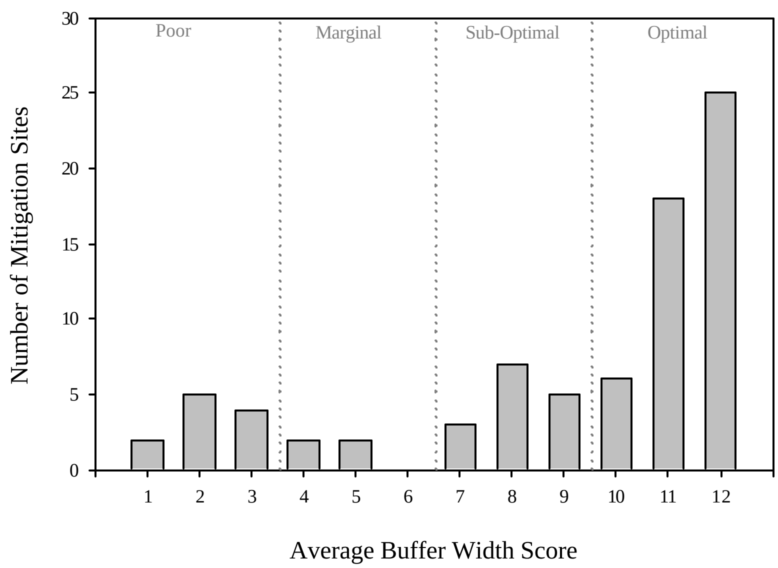

Figure 29. Average Buffer Width scores. Results from UCLA-CRAM functional assessment for 50 permit files consisting of 79 individual mitigation site evaluations.

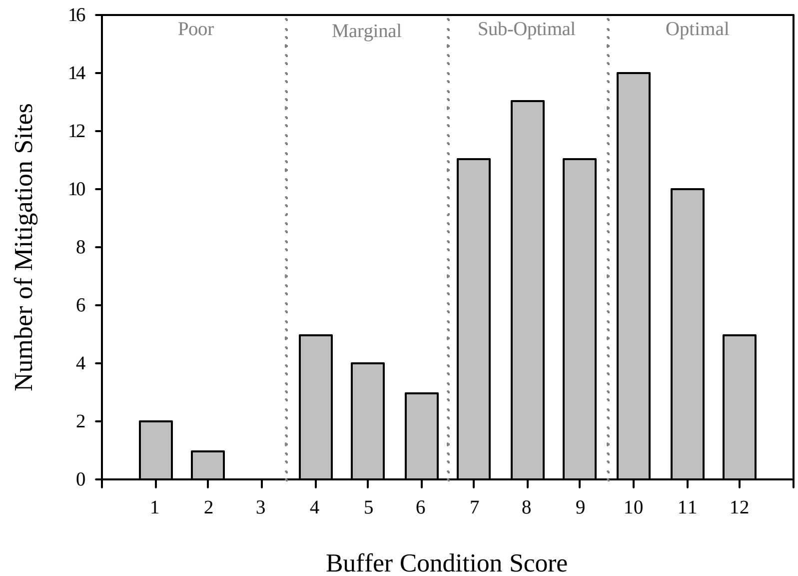

Figure 30. Buffer Condition scores. Results from UCLA-CRAM functional assessment for 50 permit files consisting of 79 individual mitigation site evaluations.

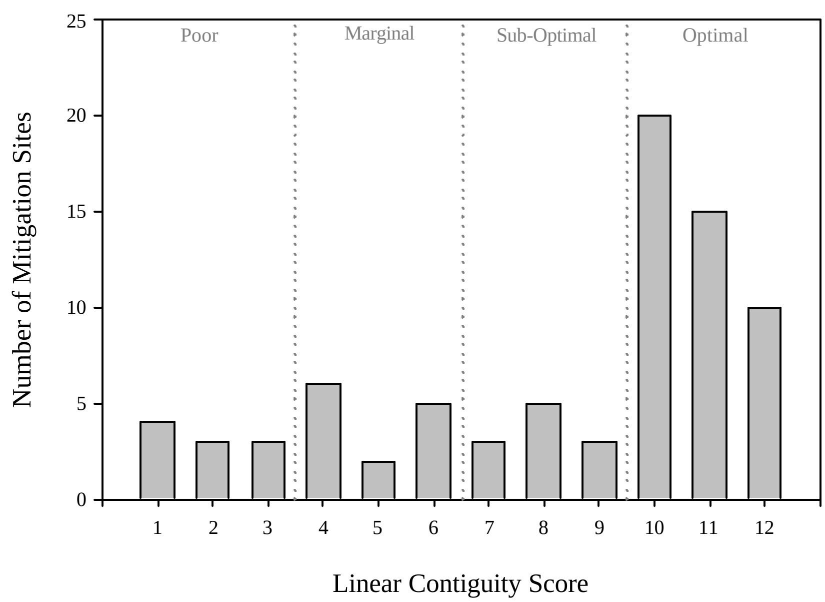

Figure 31. Linear Contiguity scores. Results from UCLA-CRAM functional assessment for 50 permit files consisting of 79 individual mitigation site evaluations.

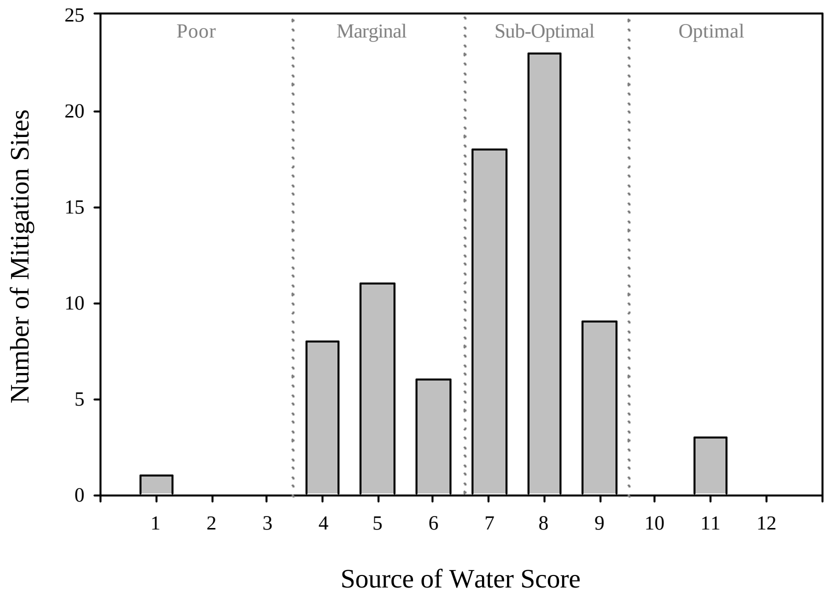

Figure 32. Source of Water scores. Results from UCLA-CRAM functional assessment for 50 permit files consisting of 79 individual mitigation site evaluations.

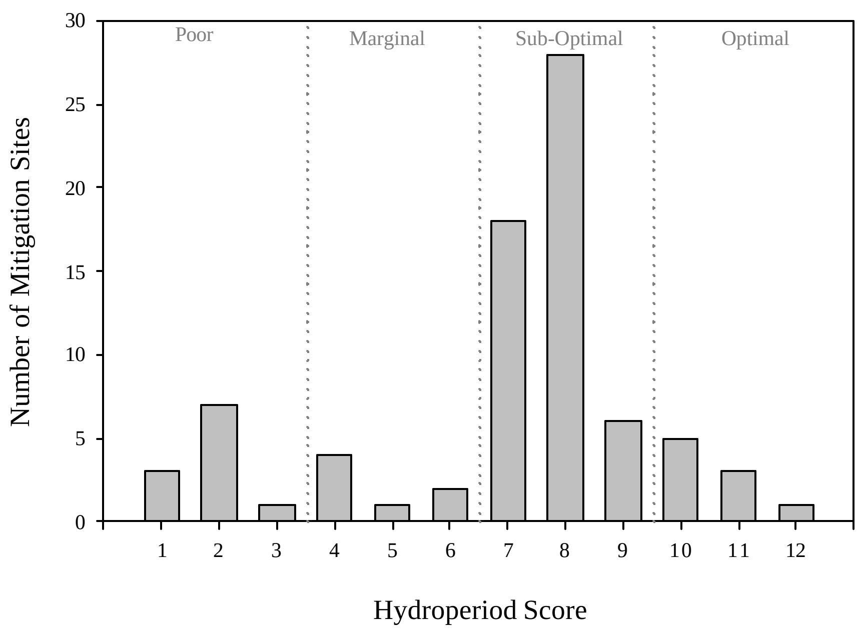

Figure 33. Hydroperiod scores. Results from UCLA-CRAM functional assessment for 50 permit files consisting of 79 individual mitigation site evaluations.

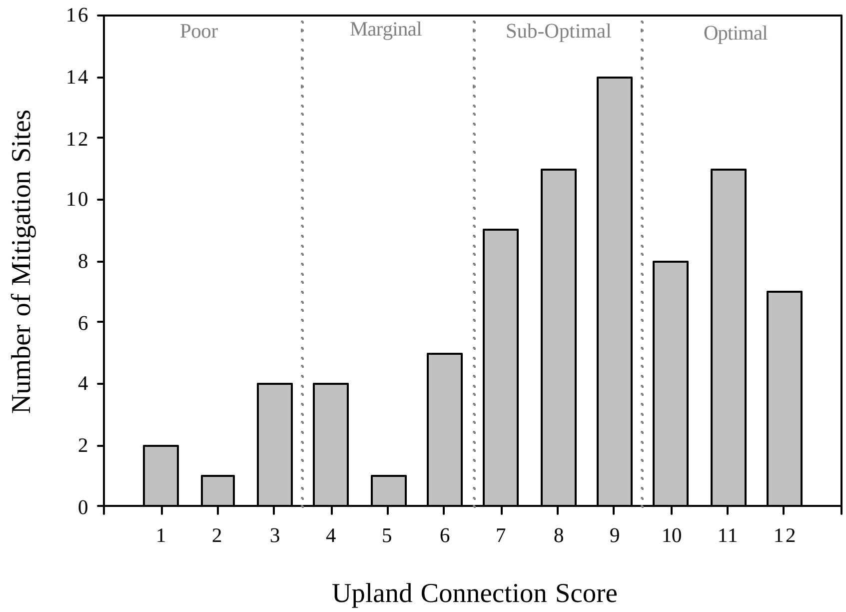

Figure 34. Upland Connection scores. Results from UCLA-CRAM functional assessment for 50 permit files consisting of 79 individual mitigation site evaluations.

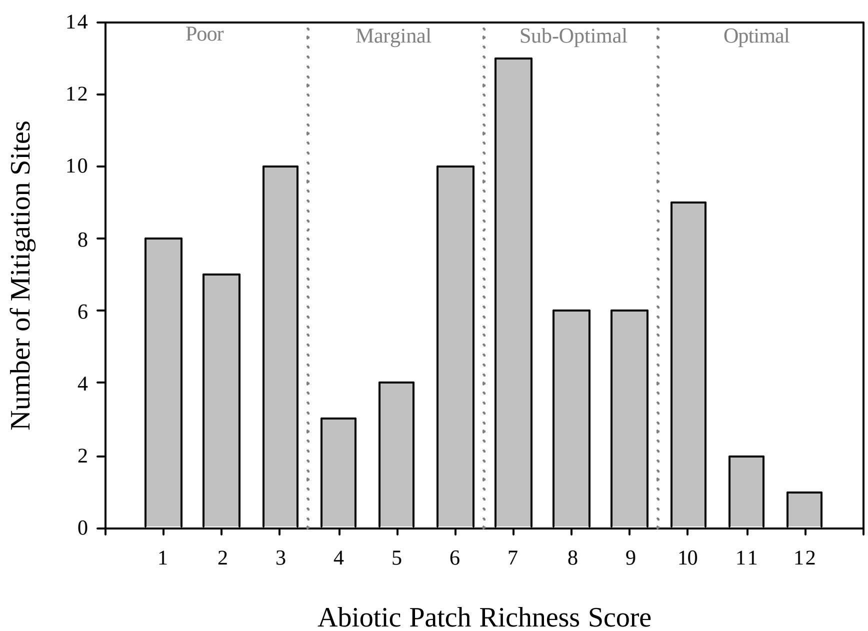

Figure 35. Abiotic Patch Richness scores. Results from UCLA-CRAM functional assessment for 50 permit files consisting of 79 individual mitigation site evaluations.

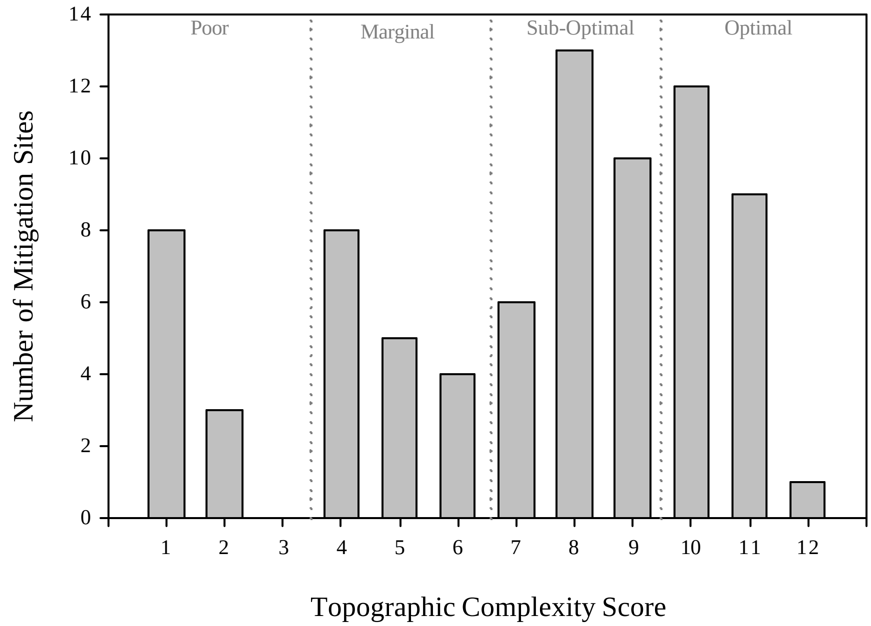

Figure 36. Topographic Complexity scores. Results from UCLA-CRAM functional assessment for 50 permit files consisting of 79 individual mitigation site evaluations.

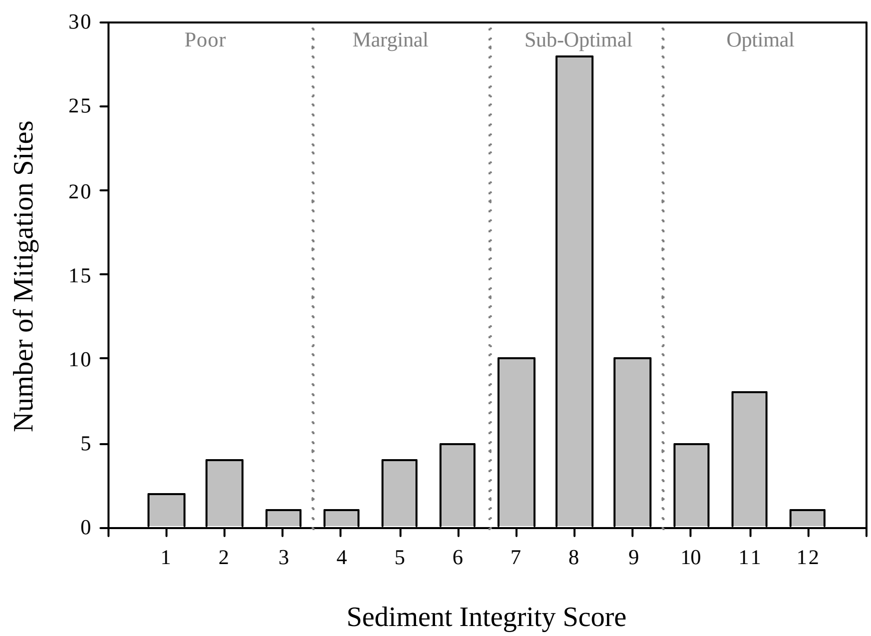

Figure 37. Sediment Integrity scores. Results from UCLA-CRAM functional assessment for 50 permit files consisting of 79 individual mitigation site evaluations.

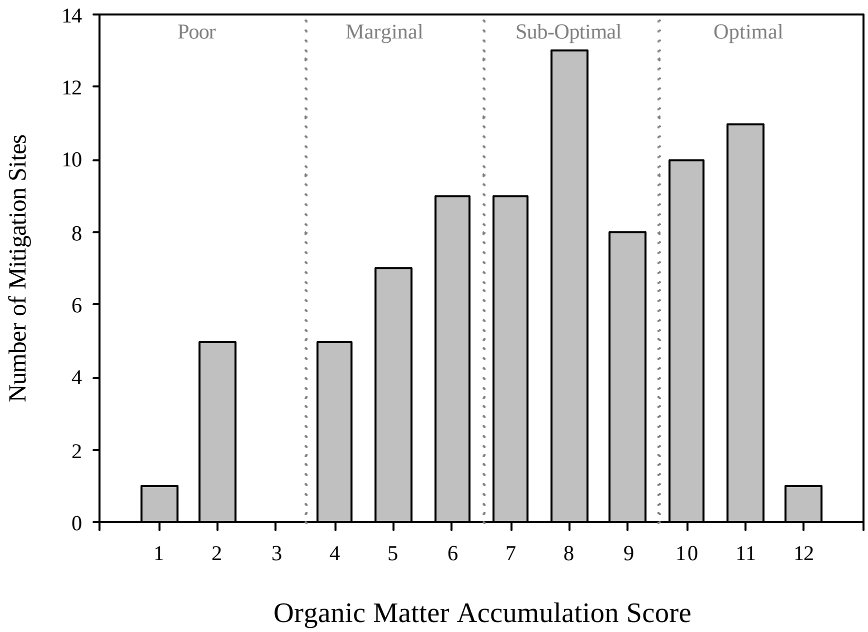

Figure 38. Organic Matter Accumulation scores. Results from UCLA-CRAM functional assessment for 50 permit files consisting of 79 individual mitigation site evaluations.

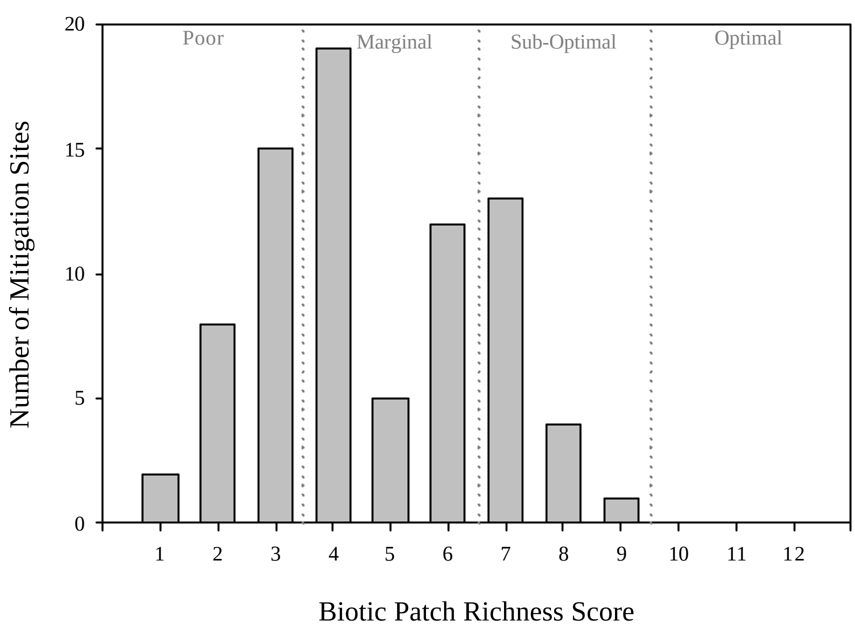

Figure 39. Biotic Patch Richness scores. Results from UCLA-CRAM functional assessment for 50 permit files consisting of 79 individual mitigation site evaluations.

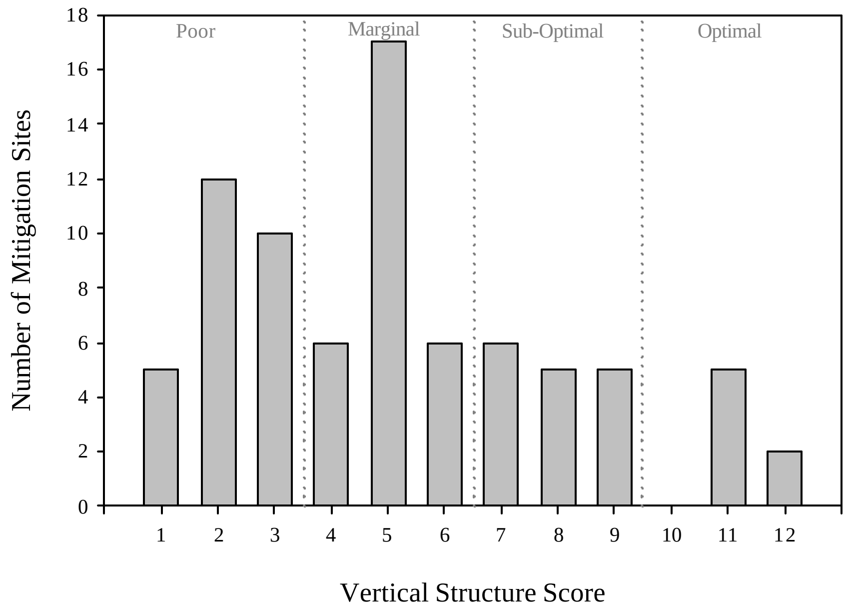

Figure 40. Vertical Structure scores. Results from UCLA-CRAM functional assessment for 50 permit files consisting of 79 individual mitigation site evaluations.

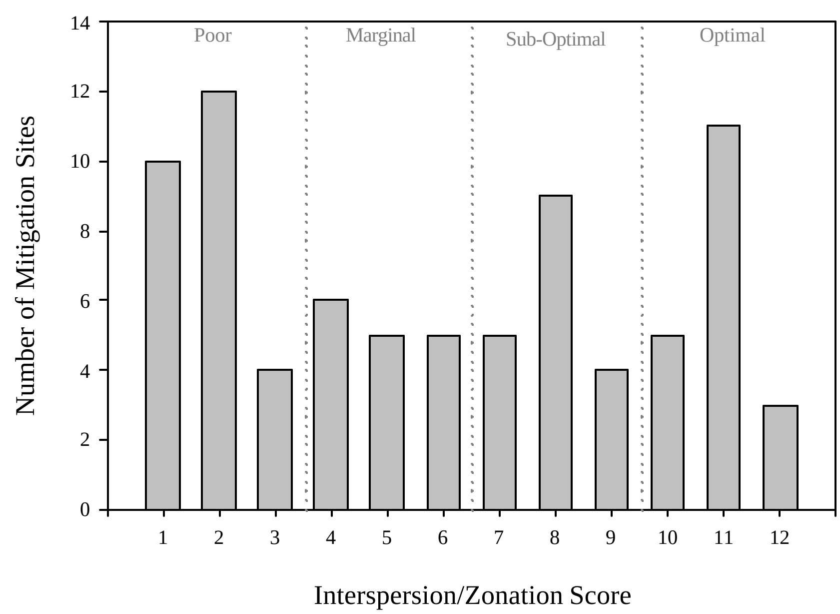

Figure 41. Interspersion and Zonation scores. Results from UCLA-CRAM functional assessment for 50 permit files consisting of 79 individual mitigation site evaluations.

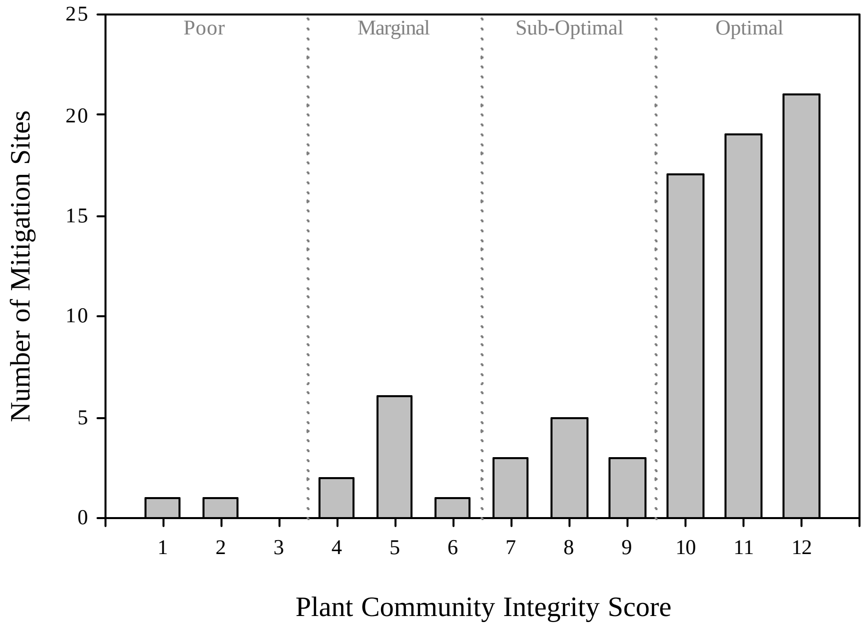

Figure 42. Plant Community Integrity scores. Results from UCLA -CRAM functional assessment for 50 permit files consisting of 79 individual mitigation site evaluations.

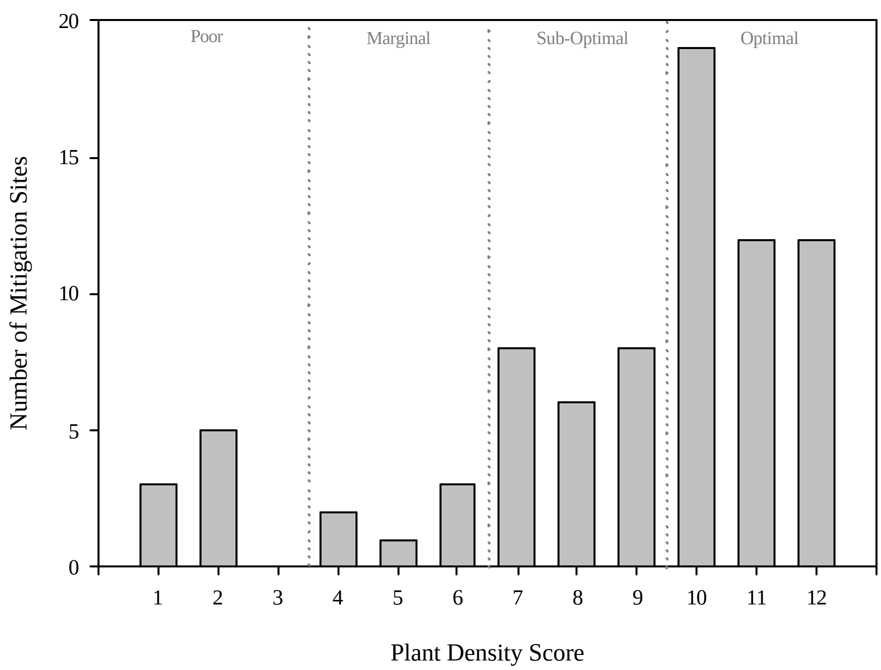

Figure 43. Supplemental Qualitative Assessment: Plant Density Scores for all sites evaluated fully (79 mitigation sites within 50 files).

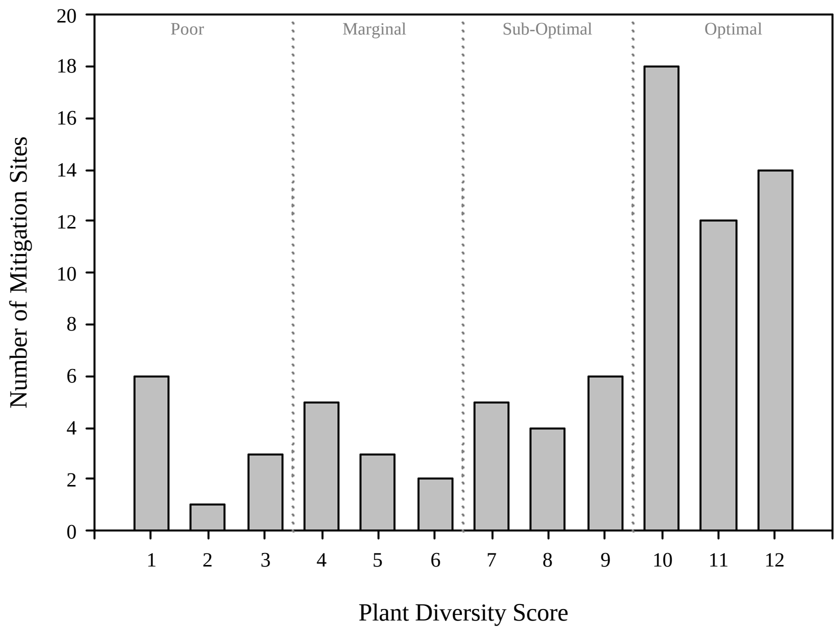

Figure 44. Supplemental Qualitative Assessment: Plant Diversity Scores for all sites evaluated fully (79 mitigation sites within 50 files).

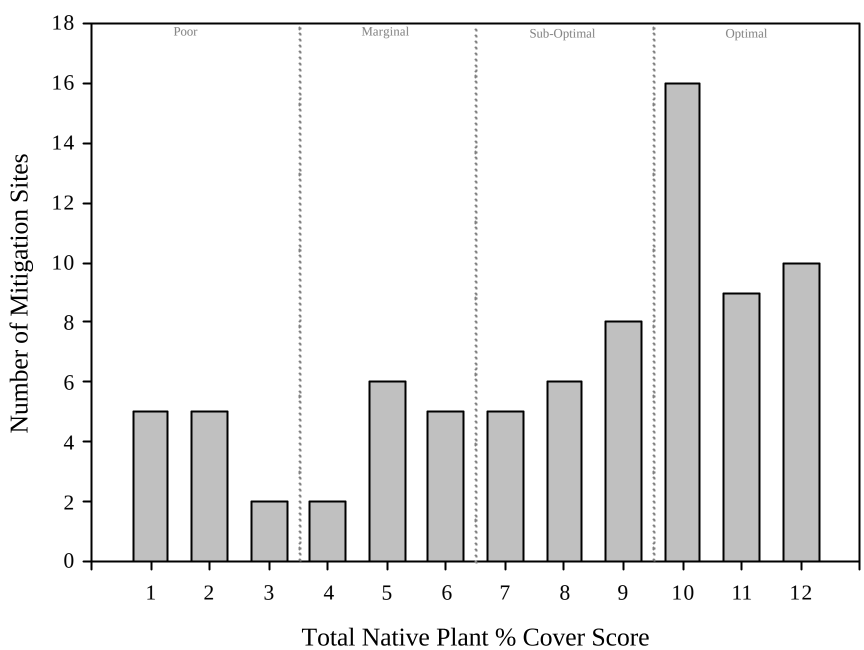

Figure 45. Supplemental Qualitative Assessment: Total Native Plant % Cover Scores for all sites evaluated fully (79 mitigation sites within 50 files).

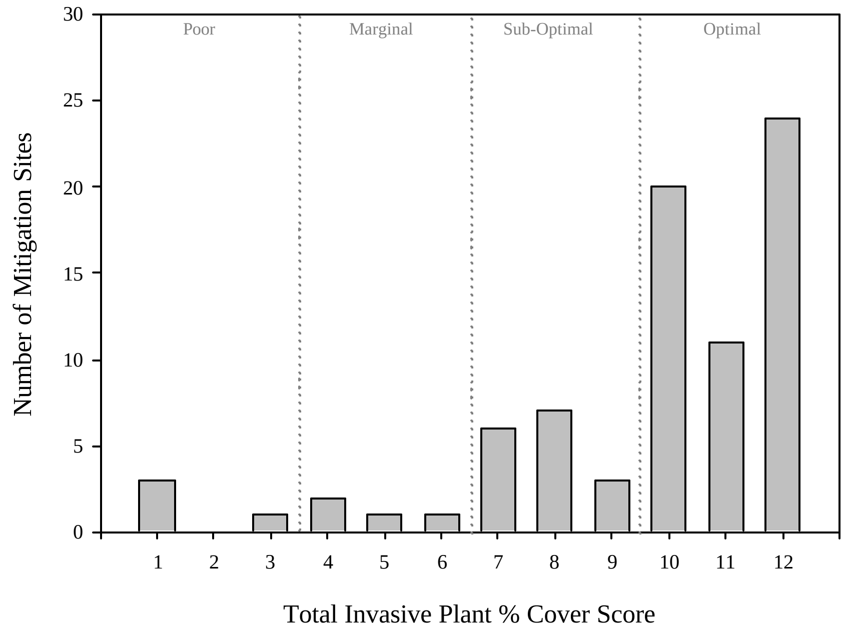

Figure 46. Supplemental Qualitative Assessment: Total Invasive Plant % Cover Scores for all sites evaluated fully (79 mitigation sites within 50 files).

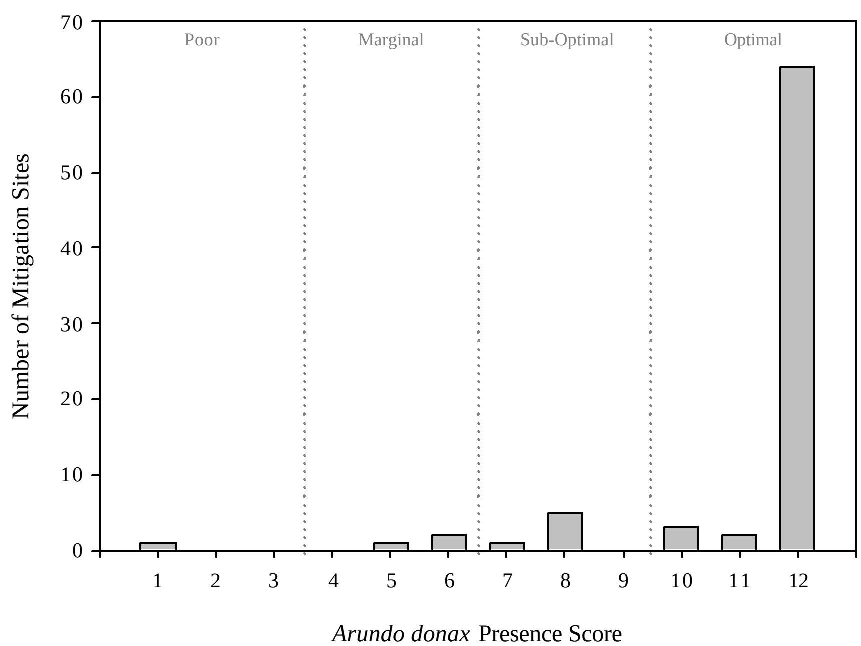

Figure 47. Supplemental Qualitative Assessment: *Arundo donax* Presence Scores for all sites evaluated fully (79 mitigation sites within 50 files).

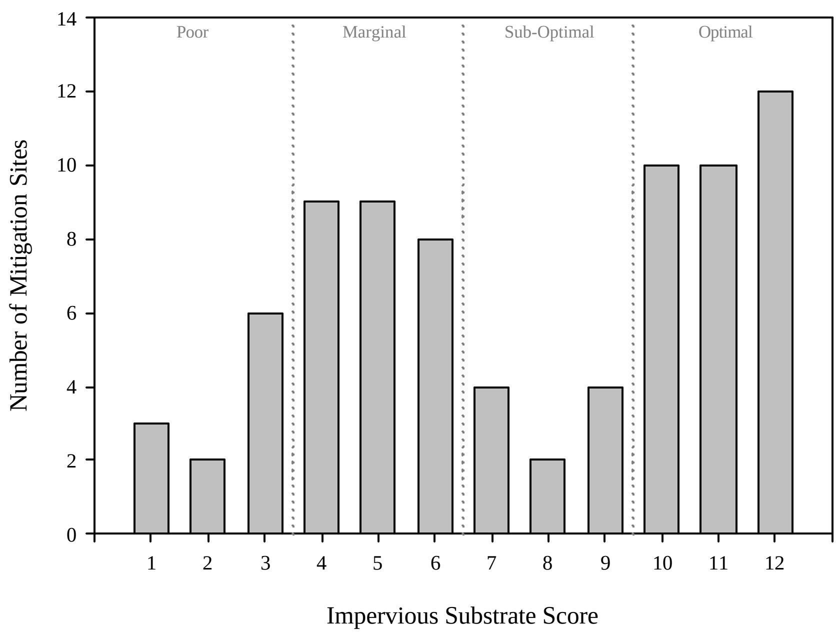

Figure 48. Supplemental Qualitative Assessment: Impervious Substrate Scores for all sites evaluated fully (79 mitigation sites within 50 files).

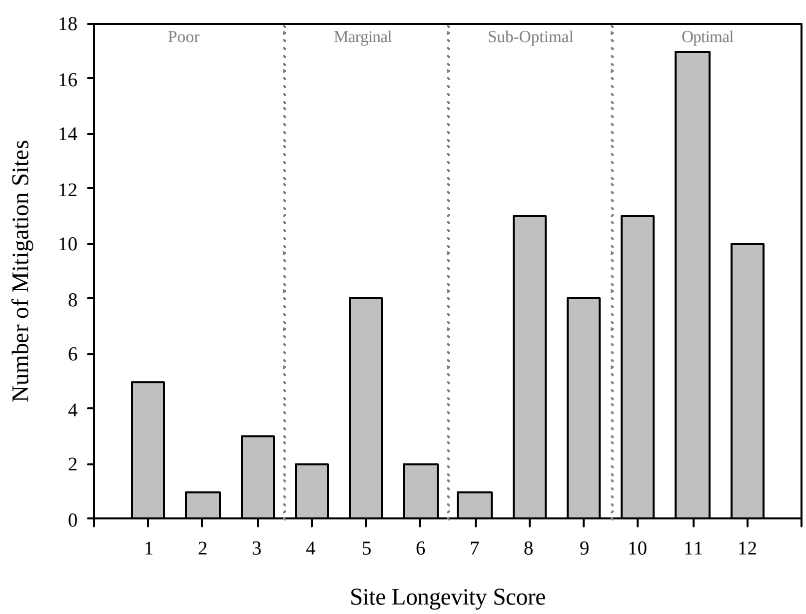

Figure 49. Supplemental Qualitative Assessment: Site Longevity Scores for all sites evaluated fully (79 mitigation sites within 50 files).

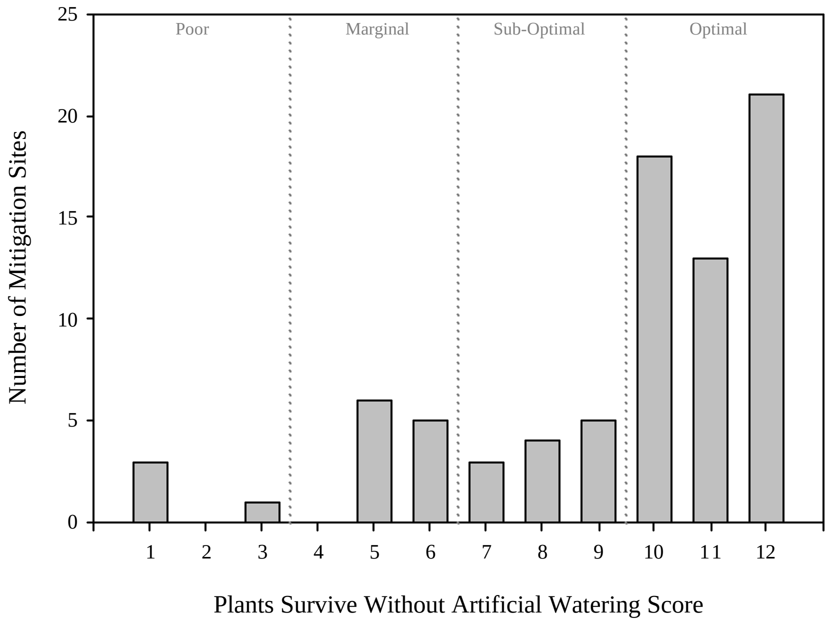

Figure 50. Supplemental Qualitative Assessment: Plants Survive Without Artificial Watering Scores for all sites evaluated fully (79 mitigation sites within 50 files).

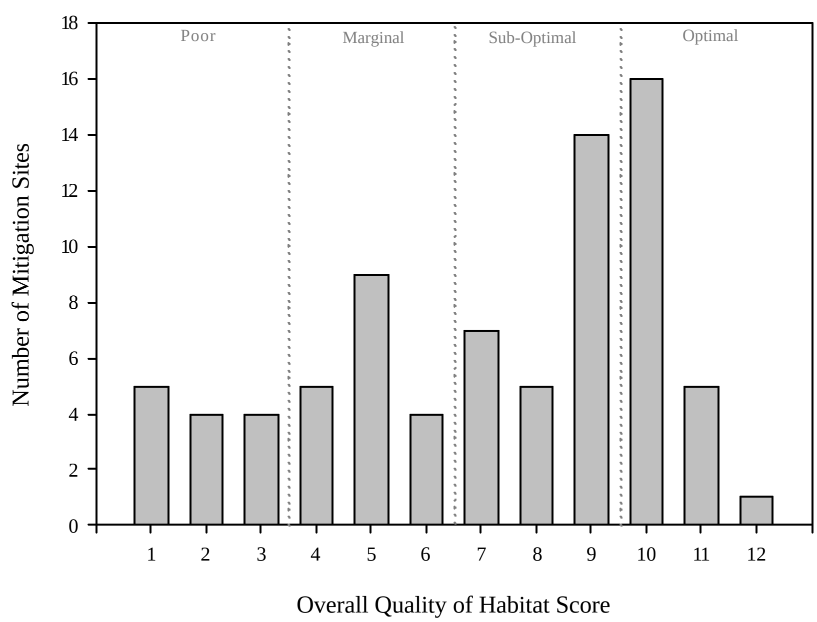

Figure 51. Supplemental Qualitative Assessment: Overall Quality of Habitat Scores for all sites evaluated fully (79 mitigation sites within 50 files).

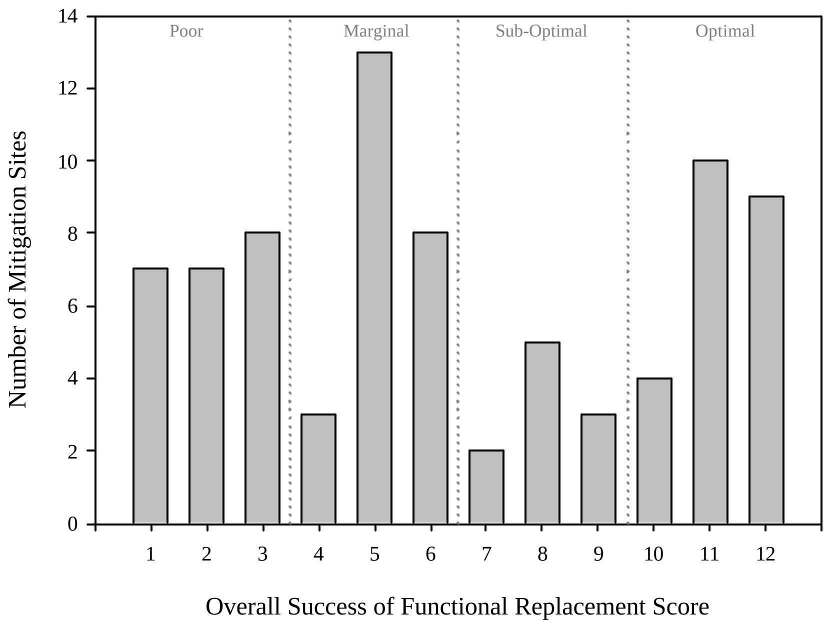

Figure 52. Supplemental Qualitative Assessment: Overall Success of Functional Replacement Scores for all sites evaluated fully (79 mitigation sites within 50 files).

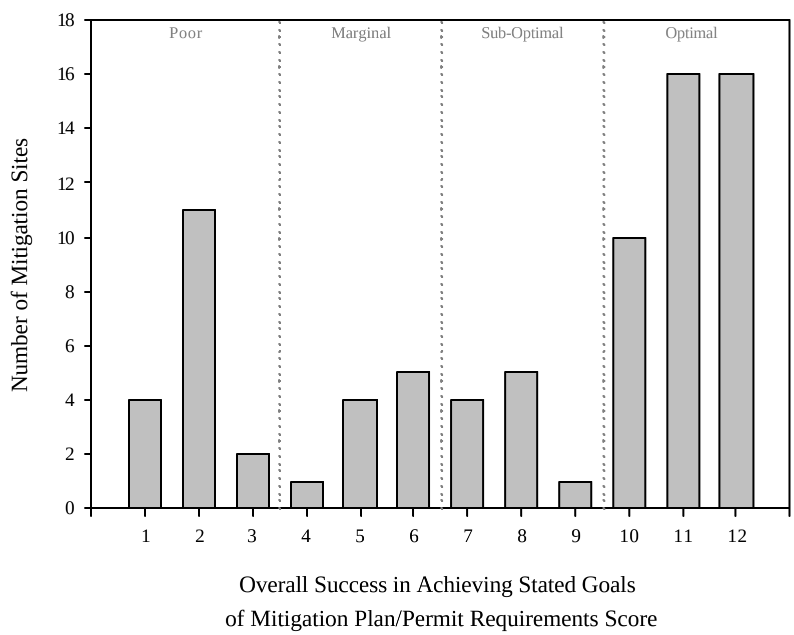

Figure 53. Supplemental Qualitative Assessment: Overall Success in Achieving Stated Goals of Mitigation Plan/Permit Requirements Scores for all sites evaluated fully (79 mitigation sites within 50 files).

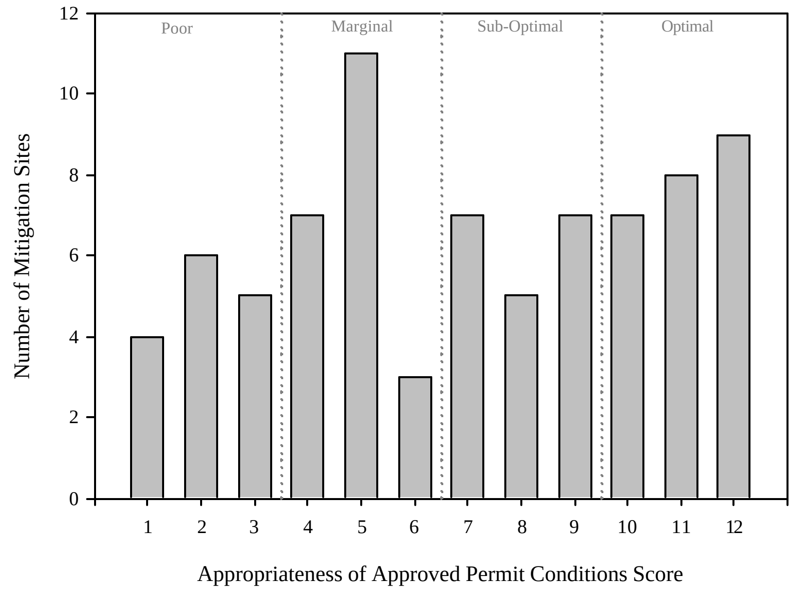

Figure 54. Supplemental Qualitative Assessment: Appropriateness of Approved Permit Conditions Scores for all sites evaluated fully (79 mitigation sites within 50 files).

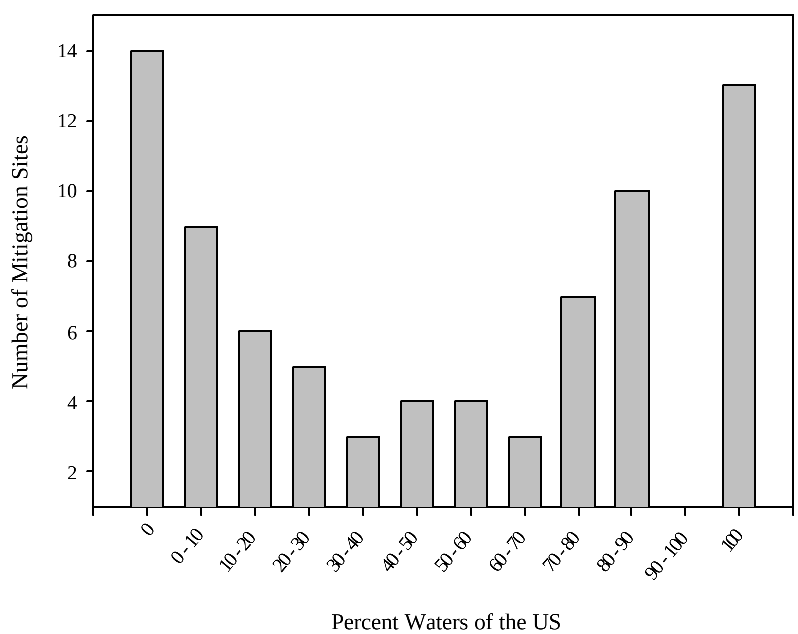

Figure 55. Percent Waters of the US at all mitigation sites evaluated fully (79 mitigation sites within 50 files) according to visual estimates of Jurisdictional Habitats.

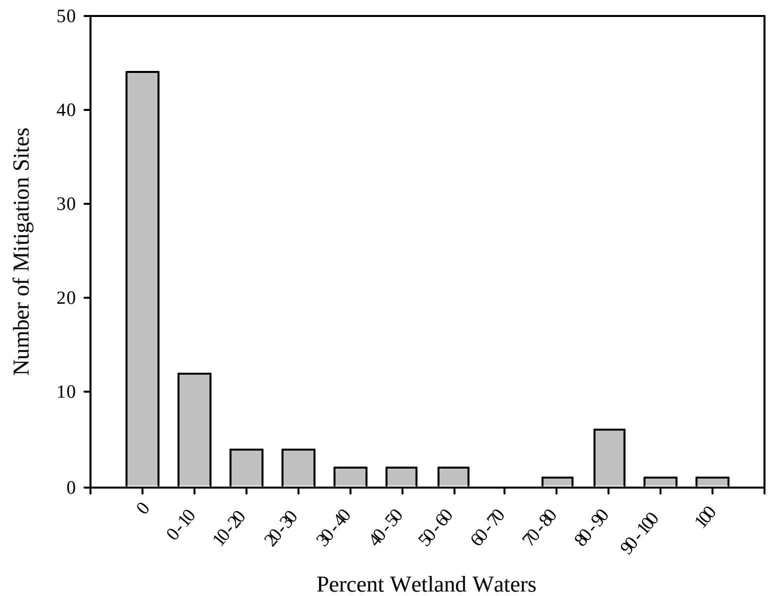

Figure 56. Percent Wetland (Waters of the US) at all mitigation sites evaluated fully (79 mitigation sites within 50 files) according to visual estimates of Jurisdictional Habitats.

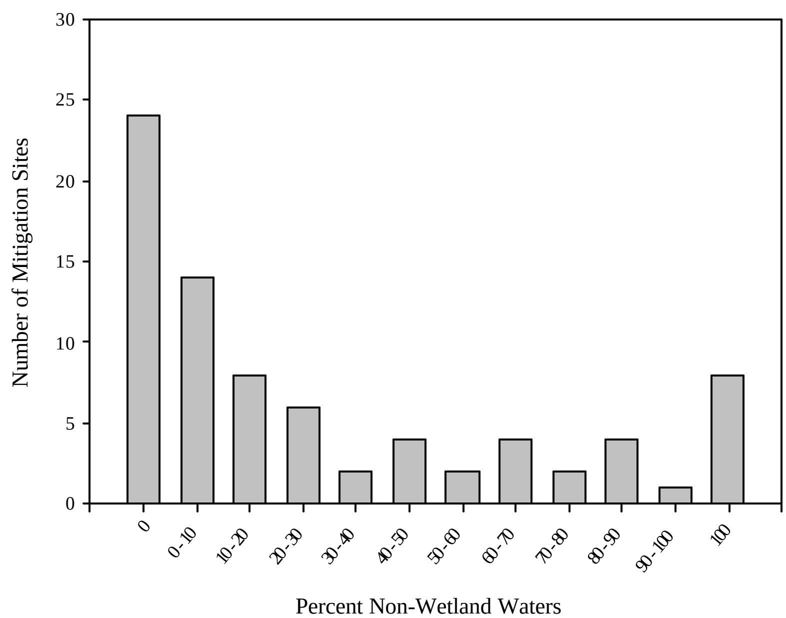

Figure 57. Percent Non-Wetland Waters (Waters of the US) at all mitigation sites evaluated fully (79 mitigation sites within 50 files) according to visual Estimates of Jurisdictional Habitats.

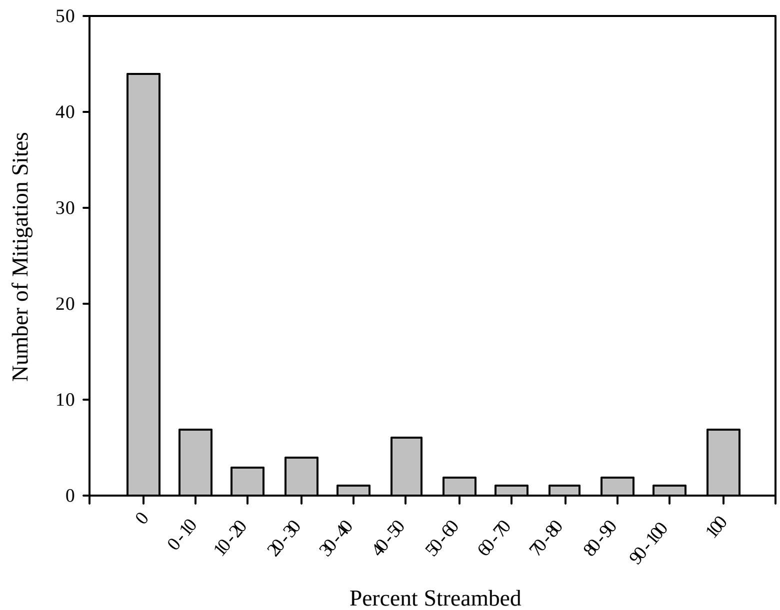

Figure 58. Percent Streambed (Waters of the US) at all mitigation sites evaluated fully (79 mitigation sites within 50 files) according to visual estimates of Jurisdictional Habitats.

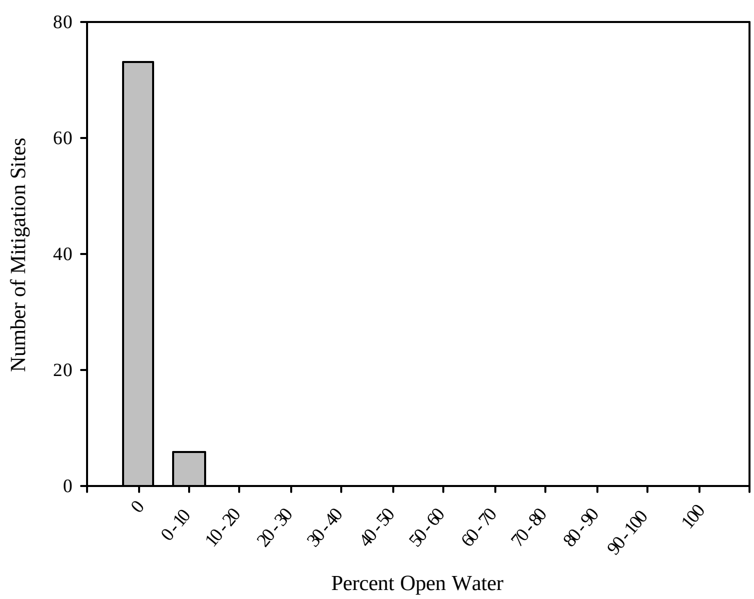

Figure 59. Percent Open Water (Waters of the US) at all mitigation sites evaluated fully (79 mitigation sites within 50 files) according to visual estimates of Jurisdictional Habitats.

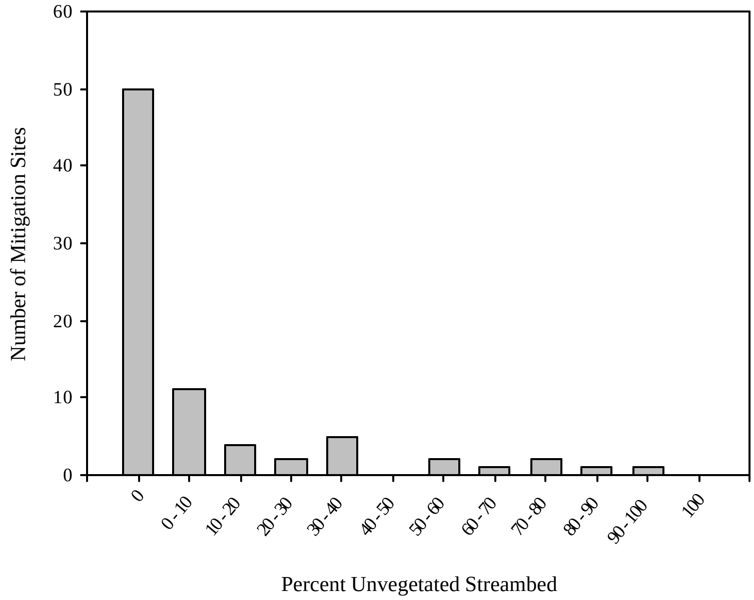

Figure 60. Percent Unvegetated Streambed (Waters of the US) at all mitigation sites evaluated fully (79 mitigation sites within 50 files) according to visual estimates of Jurisdictional Habitats.

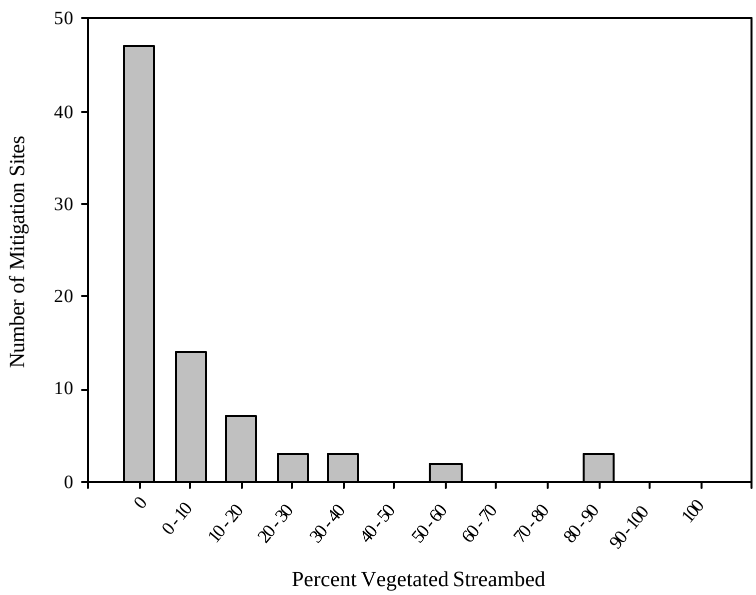

Figure 61. Percent Vegetated Streambed (Waters of the US) at all mitigation sites evaluated fully (79 mitigation sites within 50 files) according to visual estimates of Jurisdictional Habitats.

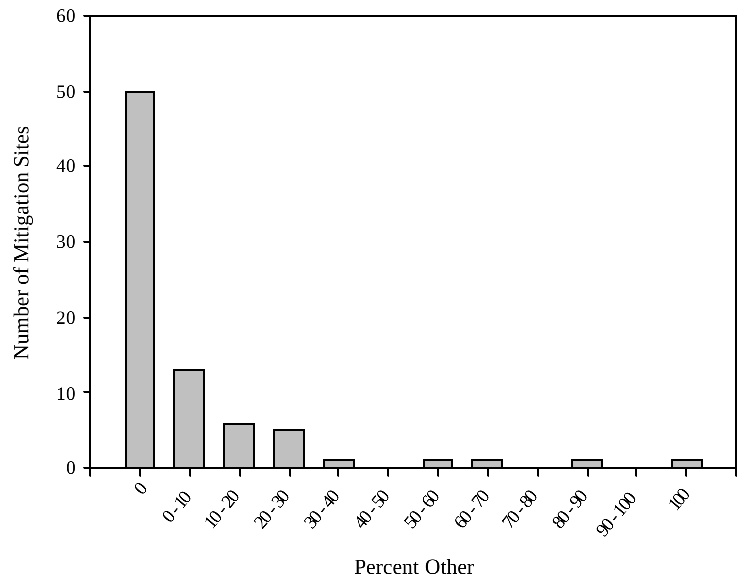

Figure 62. Percent Other (Waters of the US) at all mitigation sites evaluated fully (79 mitigation sites within 50 files) according to visual estimates of Jurisdictional Habitats.

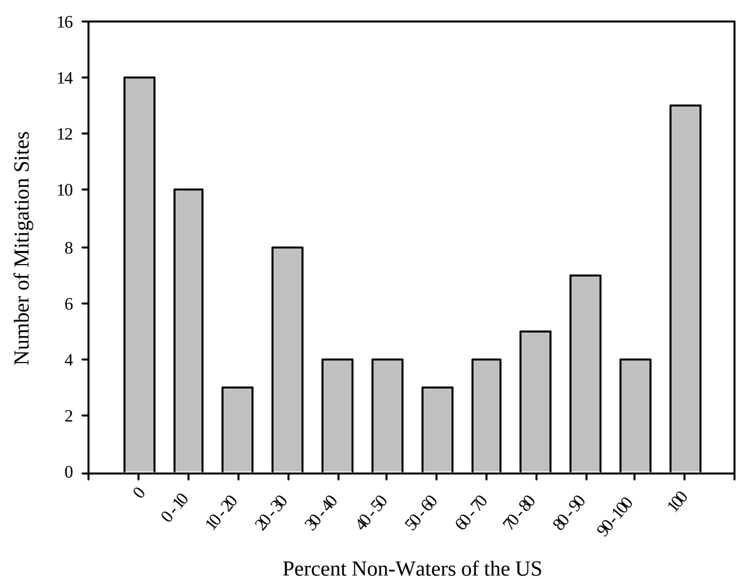

Figure 63. Percent Non-Waters of the US at all mitigation sites evaluated fully (79 mitigation sites within 50 files) according to visual estimates of Jurisdictional Habitats.

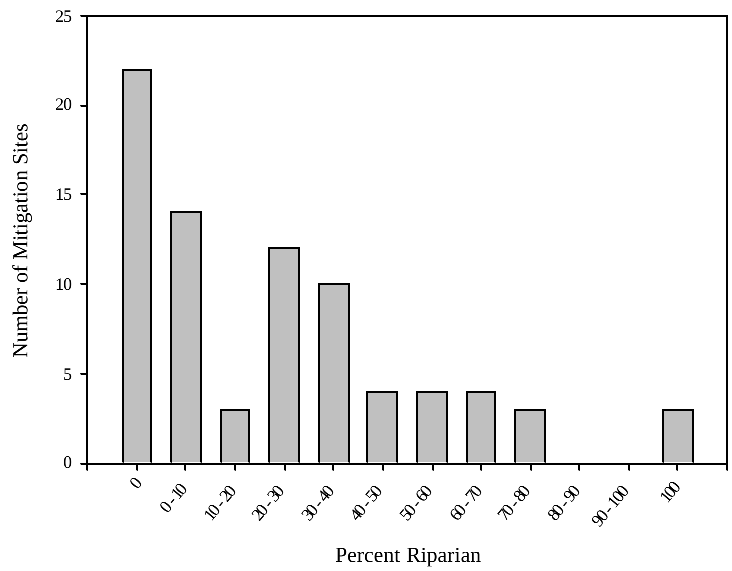

Figure 64. Percent Riparian (Non-Waters of the US) at all mitigation sites evaluated fully (79 mitigation sites within 50 files) according to visual estimates of Jurisdictional Habitats.

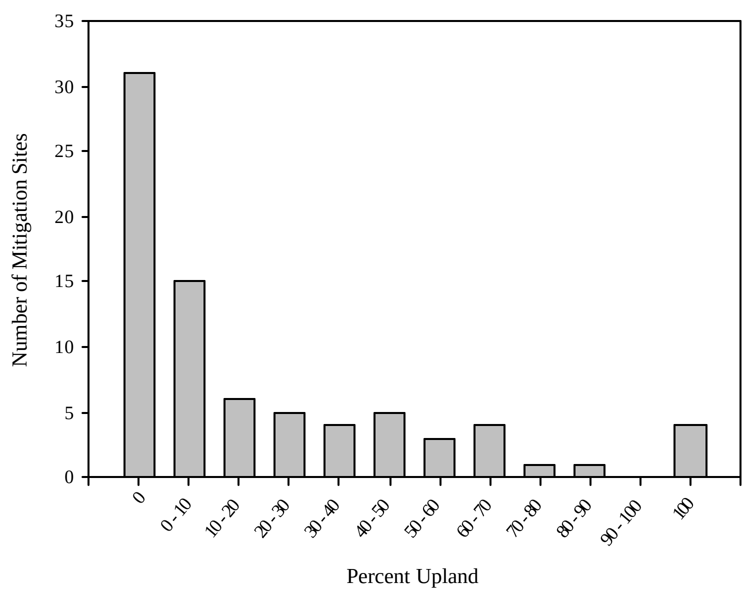

Figure 65. Percent Upland (Non-Waters of the US) at all mitigation sites evaluated fully (79 mitigation sites within 50 files) according to visual estimates of Jurisdictional Habitats.

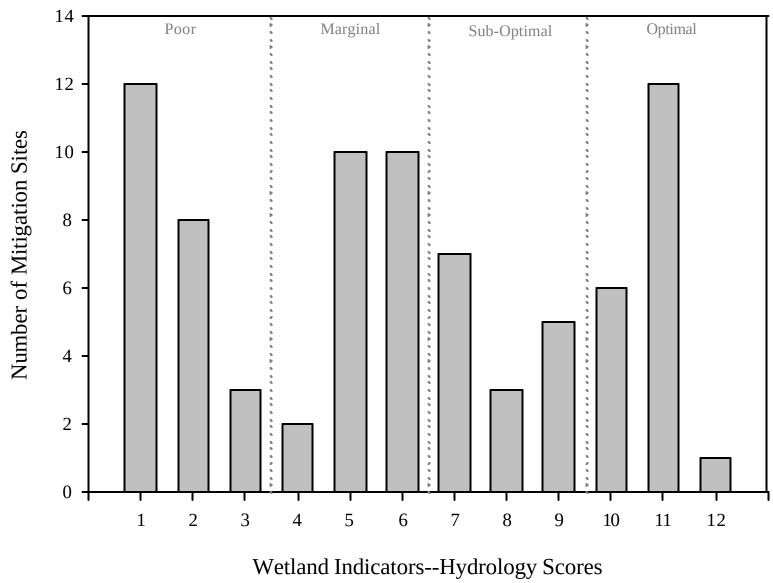

Figure 66. Wetland Indicator Assessment: Hydrology Scores for all sites evaluated fully (79 mitigation sites within 50 files).

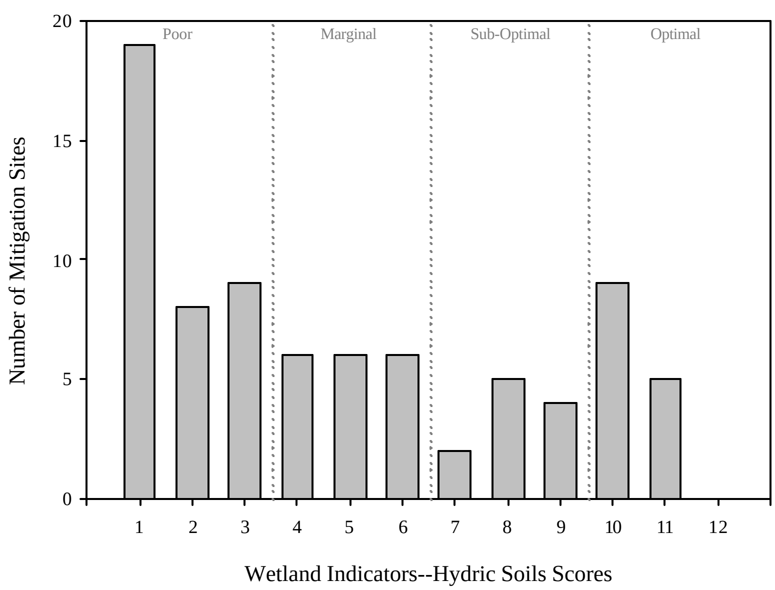

Figure 67. Wetland Indicator Assessment: Hydric Soils Scores for all sites evaluated fully (79 mitigation sites within 50 files).

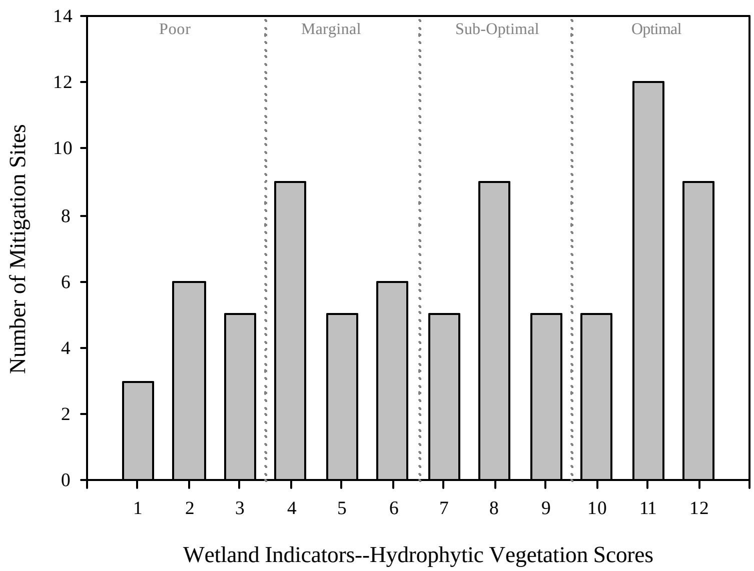

Figure 68. Wetland Indicator Assessment: Hydrophytic Vegetation Scores for all sites evaluated fully (79 mitigation sites within 50 files).

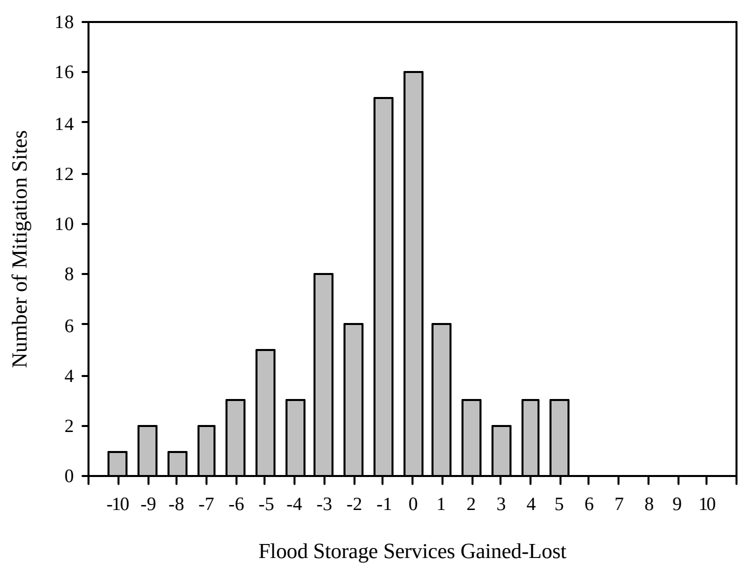

Figure 69. Flood Storage Services Gained-Lost for all sites evaluated fully (N=79 mitigation sites within 50 files).

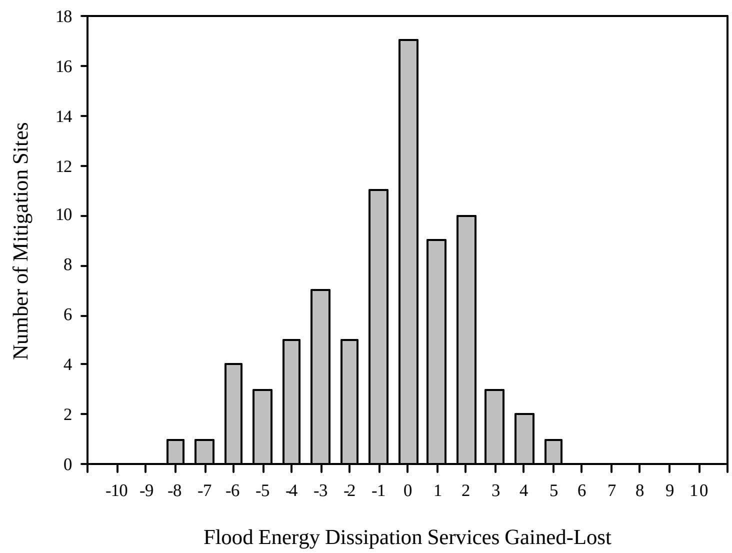

Figure 70. Flood Energy Dissipation Services Gained-Lost for all sites evaluated fully (N=79 mitigation sites within 50 files).

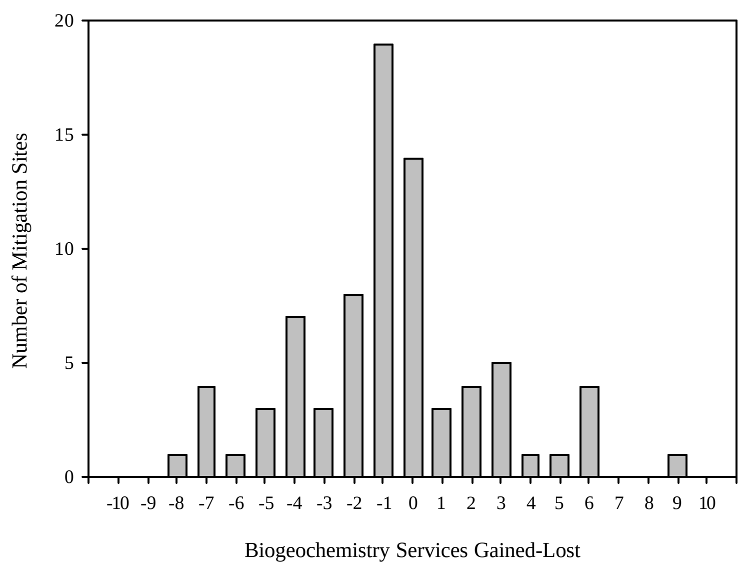

Figure 71. Biogeochemistry Services Gained-Lost for all sites evaluated fully (N=79 mitigation sites within 50 files).

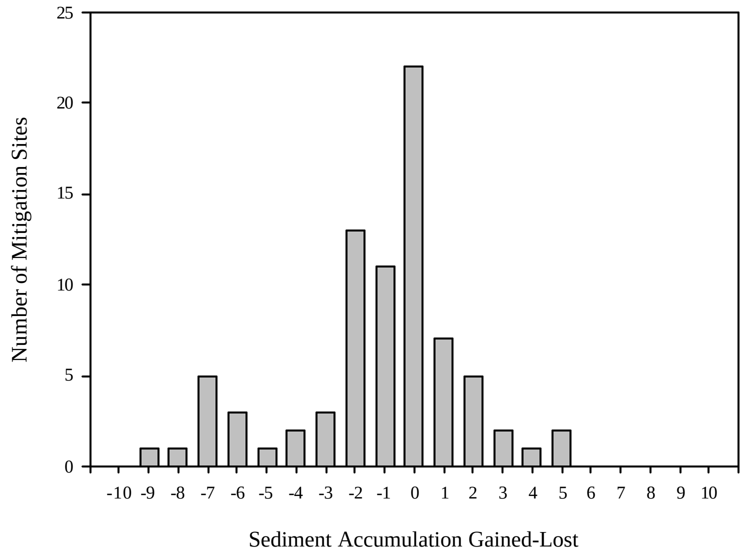

Figure 72. Sediment Accumulation Gained-Lost for all sites evaluated fully (N=79 mitigation sites within 50 files).

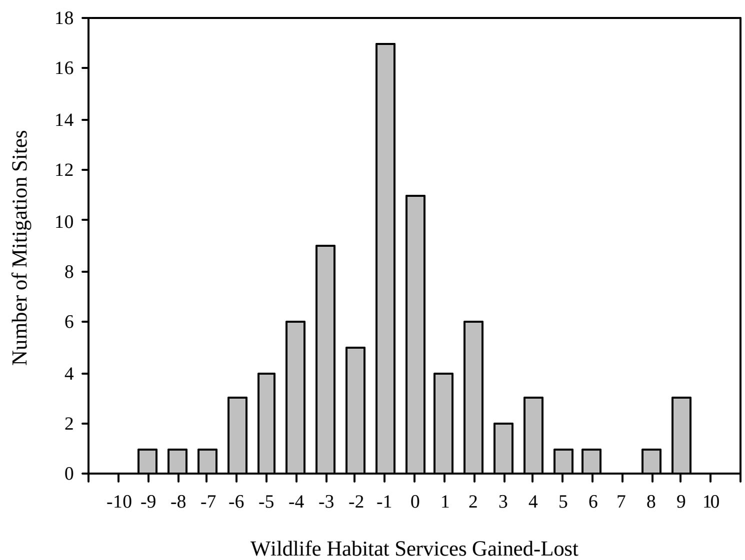

Figure 73. Wildlife Habitat Services Gained-Lost for all sites evaluated fully (N=79 mitigation sites within 50 files).

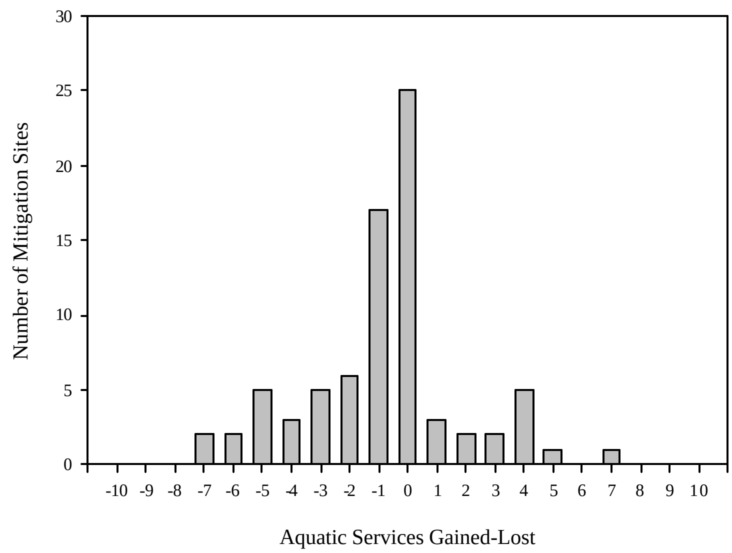

Figure 74. Aquatic Services Gained-Lost for all sites evaluated fully (N=79 mitigation sites within 50 files).

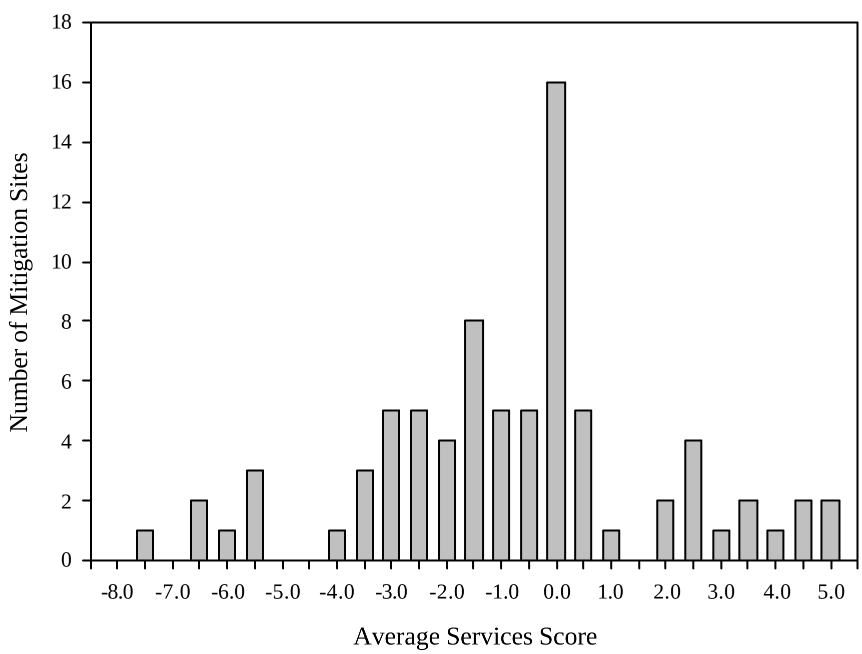

Figure 75. Services Gained-Lost Scores across all services categories (Flood Storage, Flood Energy Dissipation, Biogeochemical, Sediment Accumulation, Wildlife Habitat, Aquatic Habitat) for all sites evaluated fully (N=79 mitigation sites within 50 files).

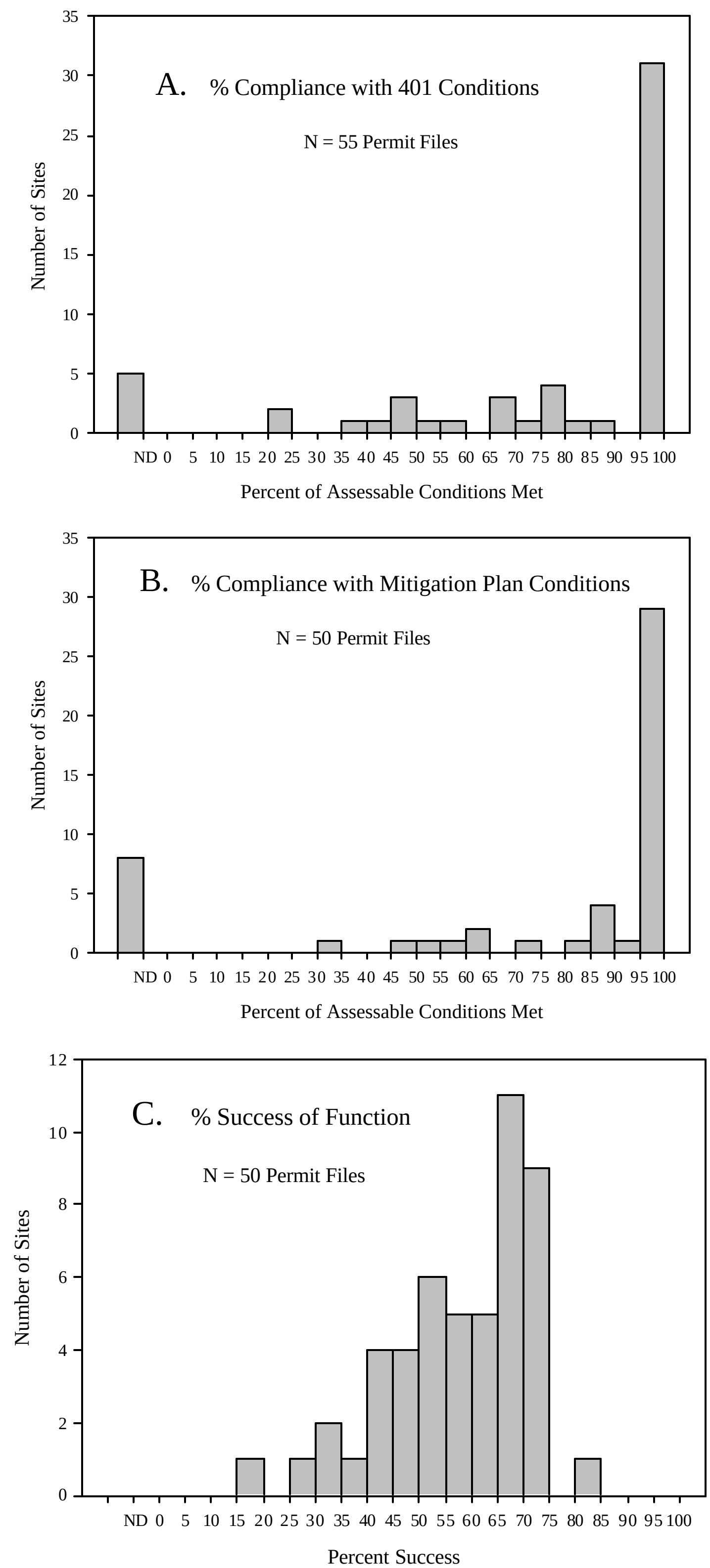

Figure 76. Frequency histogram showing the distribution of overall compliance and success scores for all permit files assessed. Three success criteria are considered here: % compliance in meeting the assessable 401 permit conditions, % compliance in meeting the assessable conditions specified in the mitigation plan (a proxy for all agency requirements in the 401, 404, and 1600 permits), and the overall UCLA -CRAM functional evaluation score.

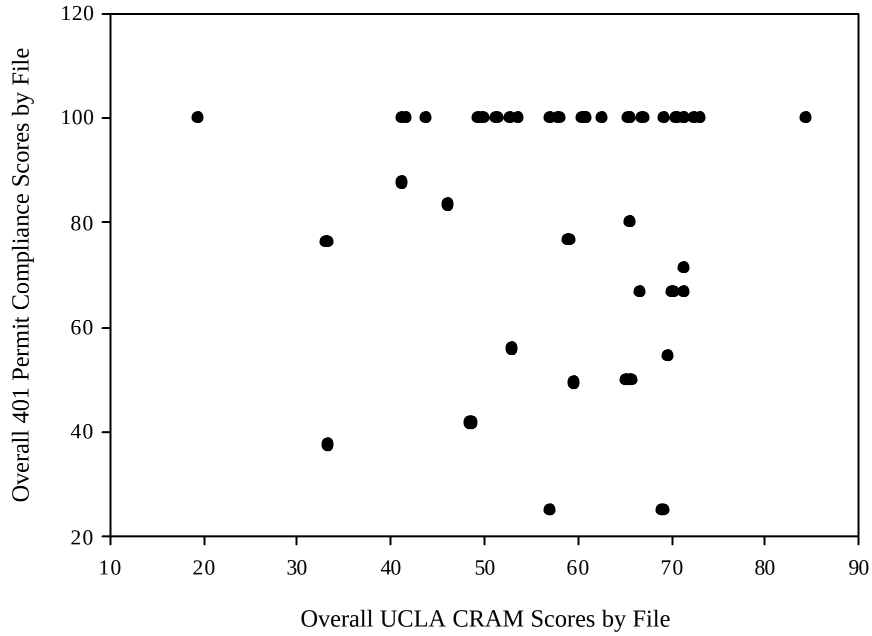

Figure 77. Correlation analysis between the overall 401 permit compliance score, and the overall UCLA-CRAM score by file for the 50 fully assessed (Phase II) permit files.

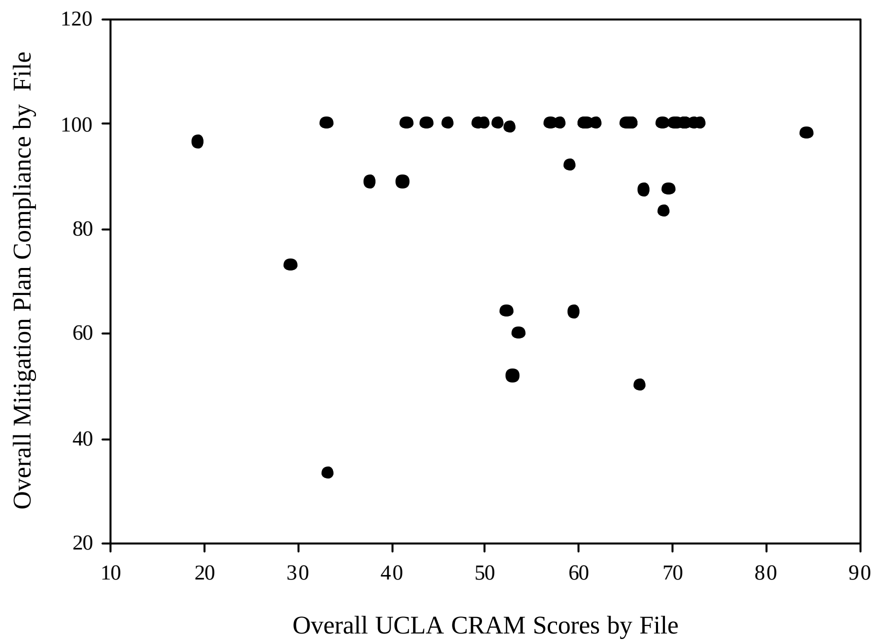

Figure 78. Overall Correlation analysis between the overall mitigation plan compliance score, and the overall UCLA-CRAM score by file for the 50 fully assessed (Phase II) permit files.

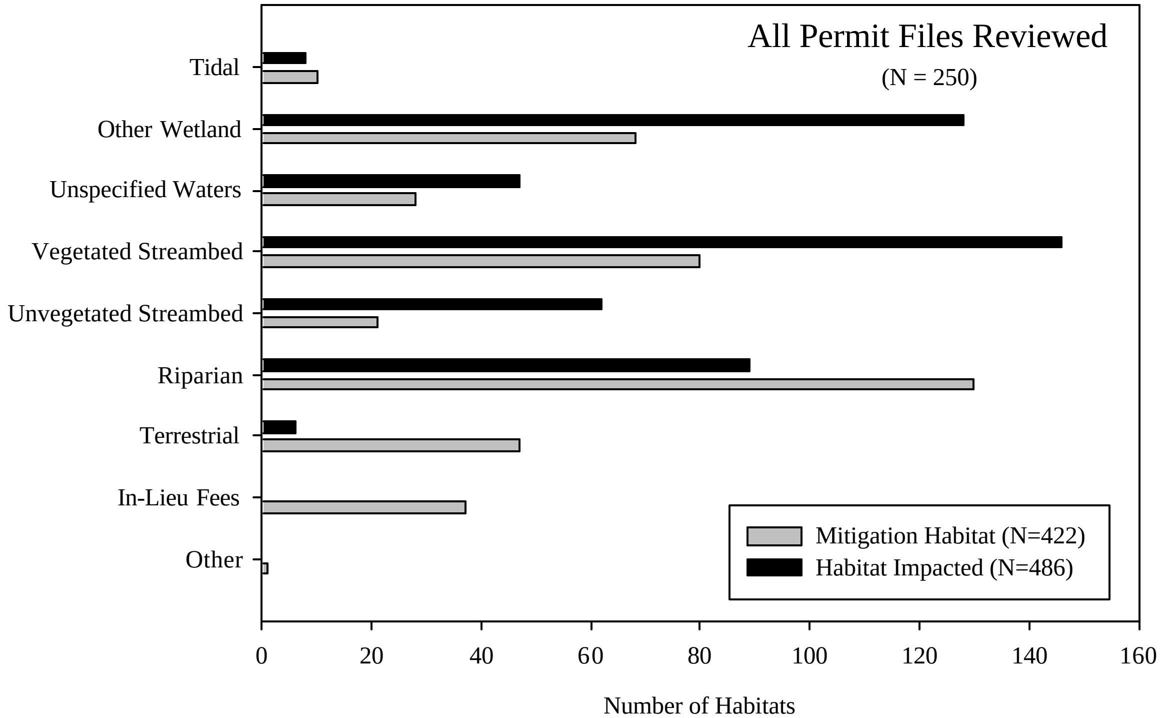

Figure 79. Comparison of the habitat types lost at impact sites vs. habitats created, restored, enhanced, or preserved at mitigation sites for all 250 Permit Files reviewed in the initial phase of this project. Most permit files involve multiple habitat types at both impact and mitigation sites.

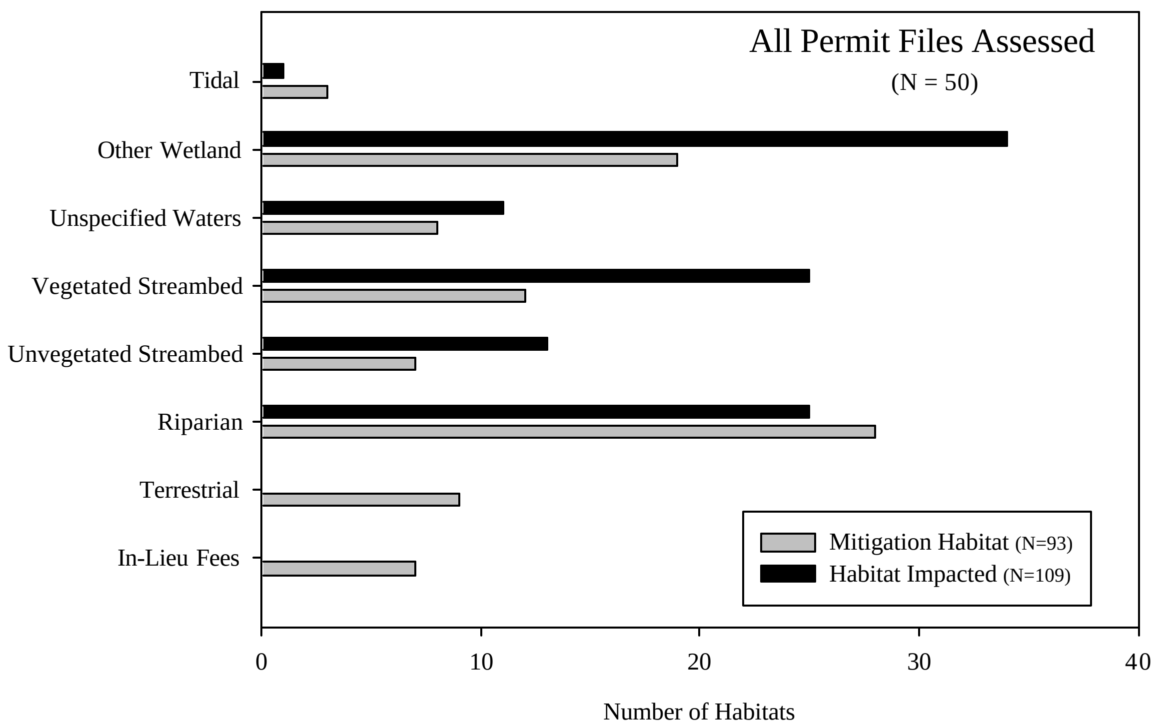

Figure 80. Comparison of the habitat types lost at impact sites vs. habitats created, restored, enhanced, or preserved at mitigation sites for the 50 Permit Files reviewed in the functional evaluation (Phase II) portion of this project. Most permit files involve multiple habitat types at both impact and mitigation sites.

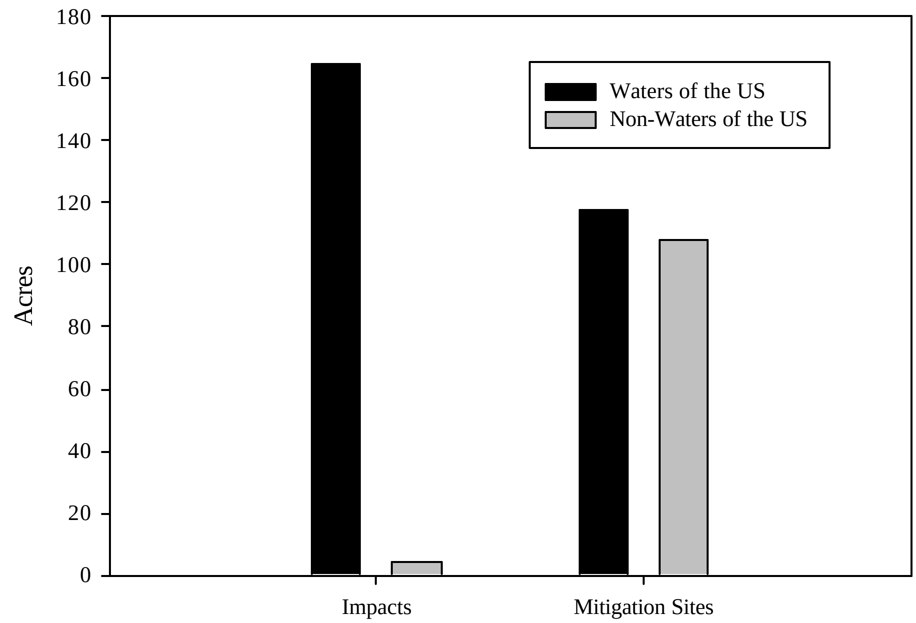

Figure 81. Acreage of Impacts and Mitigation Sites displayed by Jurisdictional Habitat Classifications: "waters of the US" and non-jurisdictional waters (Non-Waters of the US) (N=110 impacts for "Impacts"; N=79 sites for "Mitigation Sites"). The data for impact sites were taken directly from the fifty fully assessed 401 permit files which only consider losses within "waters of the United States." The estimated proportions of habitat types were taken within the assessed boundaries of all 79 individual mitigation sites that comprised the set of 50 Phase II permit files. Preservation areas were not included here.

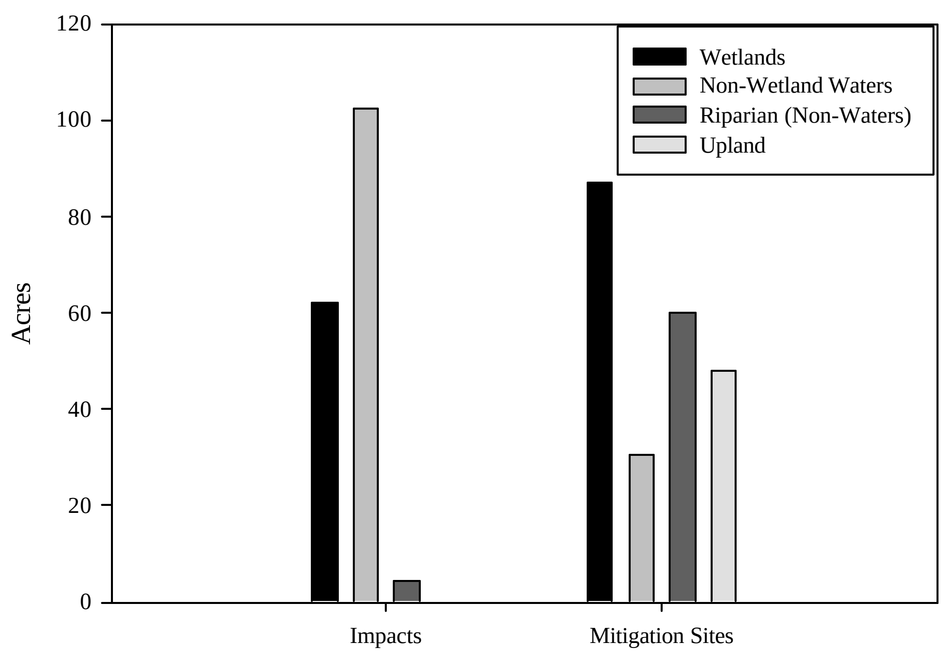

Figure 82. Data as above, with data for "Waters of the US" proportioned into wetland and non-wetland waters habitats, and data for "Non-Waters" proportioned into riparian and upland habitats.

10. Appendices

10.1. Appendix 1: Review of existing wetland assessment methods

The following is an annotated list of some of the existing wetland assessment methods that were consulted during the process of selecting wetland assessment methods for this project.

Ambrose, R.F., S.F. Lee and S.P. Bergquist. 2003. Environmental Monitoring and Bioassessment of Coastal Watersheds in Ventura and Los Angeles Counties. Final Report to: Los Angeles Regional Water Quality Control Board.

This study involved the environmental assessment of numerous stream reaches in three southern California watersheds using a combination of several existing methodologies (including EPA EMAP and California Department of Fish and Game Rapid Bioassessment methods) and novel approaches developed for the study. One of these novel approaches was a rapid qualitative assessment of local wildlife use at the sites; this approach was adopted and further modified for the present study.

Breaux, A. and M. Martindale. 2003. Wetland Ecological and Compliance Assessments in the San Francisco Bay Region, California. Draft Final Report to the San Francisco Bay Regional Water Quality Control Board, California State Water Resources Control Board, California Coastal Conservancy, and US Army Corps of Engineers, San Francisco District. July 31, 2003.

This method (referred to as Wetland Ecological Assessment or WEA) is a modified and adapted version of the Florida Wetland Rapid Assessment Procedure (WRAP) which was designed to evaluate the condition of mitigation sites. Like WRAP, the emphasis of this method is on habitat condition, especially vegetation condition. The WEA procedure includes both a rapid assessment of condition and a thorough characterization of the floral and faunal communities by local experts. While this latter step was beyond the limits of our scientific and budgetary abilities, we adopted the rapid assessment portion of WEA for this study. We elected to implement this method because the additional time requirement would be minor and because of the methodological comparisons it would provide. For instance, we could compare the results from the CRAM, WEA, and supplemental protocols for all of our sites and WEA evaluations made between northern and southern California sites.

Brinson, M.M. 1993. A Hydrogeomorphic Classification for Wetlands. U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, MS, USA. Technical Report WRP-DE-4.

This method (HGM Assessment Method) was designed to be a rapid, semi-quantitative means of determining wetland condition in both the regulatory and non-regulatory context. This method is based on the comparison of a site's condition to the highest attainable reference condition for the region. This method has been used in a number of studies in southern California, based either on the national model for riparian ecosystems or a draft regional model developed in the Santa Margarita River watershed (and subsequently tested outside that watershed). For this project, HGM was not used because of concerns about universal applicability (an HGM model must be developed and tested for every regional subclass of wetland, and to date only a draft riparian model exists, so a

number of wetland subclasses that could potentially be mitigation sites could not be assessed).

Collins, J.N., E.D. Stein, and M. Sutula. 2004. California Rapid Assessment Methods for Wetlands v2.0: User's Manual and Scoring Forms.

This relatively new method (CRAM) has been designed for the rapid assessment of wetland condition for California's wetland resources. CRAM was developed by a team of experts specializing in the biology, hydrology, and regulation of California's wetlands (including the Principle Investigator for this project). CRAM conceptualization and early development coincided with and provided some incentive for a recent review of rapid assessment methods (Fennessy et al., 2004). The verification and calibration phases of this method are not yet complete, but the current version (v2.0) was ready for verification at the beginning of our study. CRAM was chosen to be the primary method used in the functional assessment of mitigation sites for this project because of its general applicability and the appropriate timing of its development. While this method was not specifically designed for mitigation sites, it was meant to be general enough to be applicable to mitigation sites. Through a cooperative agreement with the developers of CRAM, we adopted this method and agreed to use the data collected in this project as part of CRAM verification, specifically to evaluate its potential use at mitigation sites. CRAM was applied to mitigation sites following the protocol outlined in CRAM version 2.0. CRAM v2.0 uses a non-linear grading scale (A, B, C, or D) and our use of CRAM followed that protocol. In addition, we also recorded a supplementary CRAM score using a linear 'one-to-twelve' scale that we superimposed over the regular CRAM letter grading scheme. The primary aims of superimposing a linear scale over the existing CRAM grading scale is to allow for greater resolution in the assessment phase of the functional results. Definitive statements can be made about score differences along a linear scale that will allow for comparison between mitigation sites. This linear 'one-to-twelve' form is contained within the Supplemental data forms set.

Fennessy, M.S., A.D. Jacobs, and M.E. Kentula. 2004. Review of Rapid Methods for Assessing Wetland Condition. EPA/620/R-04/009. U.S. Environmental Protection Agency, Washington D.C.

This is an extensive review of established rapid-assessment methods used for assessing wetland condition, commissioned by EPA to occur as CRAM (whose development is also funded by EPA) was being created and refined. The review describes and compares 16 different rapid wetland assessment protocols used in North America. Mary Kentula participated in a number of the CRAM development meetings and shared her insight developed from reviewing these different rapid assessment methods, so the structure of CRAM reflects some of the lessons learned from this review.

Lazorchak, J.M. and D.J. Klemm. 1997. EMAP Surface Waters: Field Operations and Methods for Measuring the Ecological Condition of Wadeable Streams. EPA/620/R-94/004, Office of Research Development, U.S. Environmental Protection Agency, Cincinnati.

The purpose of this method is to evaluate the environmental health of wadeable stream ecosystems through a comprehensive series of quantitative and qualitative assessments. One of the qualitative assessments involves the rapid assessment of several metrics on a 'zero-to-twenty' scale divided into four categories: Optimal, Sub-Optimal, Marginal, and Poor. We modeled our supplemental qualitative assessments after this scoring scheme, except that we decided to replace the 'zero-to-twenty' scale with an evenly distributed 'one-to-twelve' scale to reduce subjectivity. We found it difficult and time consuming to distinguish between, for example, an 11 and 12 in the Sub-Optimal category when we really just considered it low sub-optimal. Therefore, the 'one-to-twelve' scale essentially has a low, medium or high score for each category.

Mack, J.J. 2001. Ohio Rapid Assessment Method for Wetlands v5.0: User's Manual and Forms. Ohio EPA Technical Report WET/2001-1. Ohio Environmental Protection Agency Division of Surface Water, 401/Wetland Ecology Unit, Columbus, OH.

This method was developed for regulatory purposes, but also to assess ambient condition of wetlands outside the regulatory context. Six categories or metrics are evaluated each of which contains additional indices. The categories are weighted by the number of their respective indices. The total score is summed from these six categories. This score places the wetlands into three groups with distinct regulatory implications. Some "value-added" metrics are included, such as the presence of rare species. CRAM is most closely related to ORAM.

Miller, R.E., Jr. and B.E. Gunsalus. 1997. Florida Wetland Rapid Assessment Procedure. Updated 2nd edition. Technical Publication REG-001. Natural Resource Management District, West Palm Beach, FL.

This method was developed for mitigation sites and provides a rating index for evaluating created, enhanced, preserved and restored wetlands. A series of indicators are evaluated within six broader categories on a 'zero-to-three' scale, and the scores for these categories are summed to obtain a single overall score. Habitat condition is emphasized, which seems to follow from the prevalence of habitat-related performance standards in typical mitigation projects.

Stein, E.D. and R.E. Ambrose. 1998. A Rapid Assessment Method for Use in a Regulatory Context. Wetlands 18:379-392.

This study involved the development and use of a novel qualitative assessment, the Rapid Impact Assessment Method (RIAM), to evaluate the functional capacity of mitigation sites. Many of the indices used in this study were incorporated into CRAM with one notable exception: the linear contiguity of habitats. Linear contiguity is an important metric that indicates how well a mitigation site may serve as a wildlife corridor. Thus, we decided to include it in our suite of supplemental evaluations.

Sudol, M.F. 1996. Success of Riparian Mitigation as Compensation for Impacts due to Permits Issued Through Section 404 of the Clean Water Act in Orange County, California. D.Env. Dissertation, University of California, Los Angeles.

This study investigated the CWA Section 404 permit program by evaluating compensatory mitigation sites to determine how well projects met the required performance standards and if the resulting condition of the habitat was acceptable. This latter goal was met through both quick qualitative assessments and through the use of HGM.

10.2. Appendix 2: Supplemental Qualitative Assessment Methods

This appendix includes the narratives for the "supplemental qualitative assessment" evaluation criteria, including the scoring criteria for the "wetland indicators" assessment.

"Supplemental Qualitative Assessment"

Reference Condition

Unless stated otherwise, the reference condition, or the expected site conditions to which all mitigation sites should be compared is as follows:

Reference Condition: A relatively undisturbed site within the region, which has the hydrology, gradient, geomorphology, landscape position, etc., that is comparable and appropriate with respect to the mitigation site, and with the highest attainable habitat characteristics and target vegetation that the properly planned mitigation site should ultimately achieve.

Overall Quality of Habitat

Relative to the above reference condition, the overall quality of the habitat is:

Optimal – Most expected functions and values either exist (higher score) or will likely develop (reduced score). Hydrology is mostly appropriate, and vegetation and other habitat characteristics are appropriate. Recreational or other human uses of the site are minimal. Only the older and most successful sites that have reached the reference condition will be given the highest score.

Sub-Optimal – Many of the expected functions and values either exist or will likely develop, but some notable ones do not. Hydrology is somewhat suitable, but not ideal, though vegetation and other habitat characteristics are mostly appropriate.

Marginal – Some of the expected functions and values (mostly habitat related) may exist or may develop in the future, but many notable ones do not. Hydrology is mostly inappropriate or non-existent, though the vegetation and other habitat characteristics may provide moderate habitat for some organisms.

Poor – Only minimal functions or values exist (perhaps some scant habitat), and the potential for their future development is minor. Proper hydrology does not exist and the vegetation and other habitat characteristics are substantially lacking, or absent.

Overall Success of Functional Replacement

Reference Condition: The impact site. Using the best information possible, either direct knowledge of pre-project conditions, or a best estimate of the hydrology, gradient, geomorphology, landscape position, and vegetation and other habitat charactistics of the project site compared to nearby un-impacted sites of the region.

Relative to the above reference condition, the overall success achieved in the replacement or substitution of the functions, values and services lost at the impact site is:

Optimal– Most expected functions and values either exist (higher score) or will likely develop (reduced score). Hydrology is mostly appropriate, and vegetation and other habitat characteristics are appropriate. Recreational or other human uses of the site are minimal. Only the older and most successful sites that have reached the reference condition will be given the highest score.

Sub-Optimal – Many of the expected functions and values either exist or will likely develop, but some notable ones do not. Hydrology is somewhat suitable, but not ideal, though vegetation and other habitat characteristics are mostly appropriate.

Marginal – Some of the expected functions and values (mostly habitat related) may exist or may develop in the future, but many notable ones do not. Hydrology is mostly inappropriate or non-existent, though the vegetation and other habitat characteristics may provide moderate habitat for some organisms.

Poor – Only minimal functions or values exist (perhaps some scant habitat), and the potential for their future development is minor. Proper hydrology does not exist and the vegetation and other habitat characteristics are either minimal, or absent.

Overall Success in Achieving Stated Goals of Mitigation Plan and/or Permit Reqirements

Rationale: The permittee must consider all mitigation requirements mandated by agency personnel as stated in their permits (e.g. 401, 404, and 1600) and draft a mitigation plan that will satisfy all their respective requirements. Once approved, the permittee is responsible for completing the project according to the stated tasks and goals of the mitigation plan and the conditions specifically addressed in the permits. This evaluation is intended to assess whether or not they did what they supposed to do and how well they did it, but does not consider the appropriateness of their approved plan in adequately mitigating the functions, values, and services lost at the impact site. Sites that are still within the compliance window should not be penalized for incomplete development, rather the assessor should infer fully developed conditions based on the status of present conditions.

Reference Condition: The successfully completed and fully developed mitigation site. All aspects of the planned hydrology, gradient, geomorphology, landscape position, pre-planting exotics removal and soil augmentation, planting palette and other habitat characteristics should be considered.

Relative to the above rationale and reference condition, the overall success in achieving stated goals of the mitigation plan and/or permit reqirements is:

Optimal – Most or all requirements and plan elements have been met. Acreage, requirements are met or exceeded. The location, gradient, hydrology, preparation, vegetation, habitat conditions etc. are as proposed, or mostly so. Only minor deviations from the mitigation plan may exist.

Sub-Optimal – Many requirements and plan elements have been met but some notable ones were not. Acreage, requirements are mostly met or exceeded. Any acreage shortfalls are offset by good success in meeting most of the other objectives. The location, gradient, hydrology, preparation, vegetation, habitat conditions etc. are somewhat as proposed, but there are a few key elements that are not. Only minor to moderate deviations from the mitigation plan may exist.

Marginal – A substantial number of the requirements and plan elements have not been met. Acreage, requirements may still have been met, but if so, the remainder of the objectives have largely not been met. Alternatively there are moderate acreage shortfalls and these are insufficiently offset by successful meeting of other objectives. The location, gradient, hydrology, preparation, vegetation, habitat conditions etc. are partially as proposed, but there are a many key elements that are not. Minor to substantial deviations from the mitigation plan may exist.

Poor – Most of the requirements and plan elements have not been met. Acreage, requirements may still have been met, but if so, the remainder of the objectives have either not been done, or have failed completely due to either avoidable or unavoidable actions or circumstances. Alternatively there are moderate to substantial acreage shortfalls and these are not offset by successful meeting of other objectives. The location, gradient, hydrology, preparation, vegetation, habitat conditions etc. fall far short of what was proposed. Minor to substantial deviations from the mitigation plan may exist.

Appropriateness of Approved Permit Requirements

Rationale: Approved permit conditions include those stated in all relevant permits (including the 404, 401, and 1600 permits), plus the locations, activities and methods outlined in the mitigation plan, which was accepted by the regulatory agencies. It is possible that the permittee satisfactorily complied with all aspects of this inclusive permit process resulting in the best attainable mitigation project, yet the project failed to replace the functions, values, and services lost at the impact site. This would represent a failure in the regulatory process rather than a failure of the permitted mitigation project.

Reference Condition: The impact site. Using the best information possible, either direct knowledge of pre-project conditions, or a best estimate of the hydrology, gradient, geomorphology, landscape position, and vegetation and other habitat characteristics of the project site compared to nearby un-impacted sites of the region.

Relative to the above rationale and reference condition, the appropriateness of the approved permit process in providing for the potential replacement or substitution of the functions, values and services lost at the impact site was:

Optimal – Most of the functions and values lost at the impact site either exist (higher score) or will likely develop (reduced score). Hydrology is mostly appropriate, and vegetation and other habitat characteristics are appropriate. Recreational or other human uses of the site are minimal. Only the older and most successful sites that have reached the reference condition will be given the highest score.

Sub-Optimal – Many of the expected functions and values either exist or will likely develop, but some notable ones do not. Hydrology is somewhat suitable, but not ideal, though vegetation and other habitat characteristics are mostly appropriate.

Marginal – Some of the expected functions and values (mostly habitat related) may exist or may develop in the future, but many notable ones do not. Hydrology is mostly inappropriate or non-existent, though the vegetation and other habitat characteristics may provide moderate habitat for some organisms.

Poor – Only minimal functions or values exist (perhaps some scant habitat), and the potential for their future development is minor. Proper hydrology does not exist and the vegetation and other habitat characteristics are either minimal, or absent.

Site Longevity

Relative to the above reference condition, the expected longevity of the site is:

Optimal – The mitigation site is expected to exist in perpetuity with little or no active human intervention. Management practices (invasive species removal, erosion control, mulching, artificial watering, etc.) may have been used in the early stages of site development, but should have become unnecessary before the end of the compliance window. Site must be free from direct future development (onsite) and should be free from significant increases in land use threats (upstream or adjacent influences).

Sub-Optimal – The mitigation site is expected to exist in perpetuity with a moderate level of active human intervention. Management practices were or will be necessary throughout the compliance window, and vegetation management (mainly invasive species abatement and minor replantings) will likely be required in the future. Artificial irrigation not needed beyond compliance window. Site must be free from direct future development (onsite) and should be free from significant increases in land use threats (upstream or adjacent influences).

Marginal – The mitigation site may exist in perpetuity but only with substantial human intervention. Management practices were or will be necessary throughout the compliance window, and vegetation management will almost certainly be required in the future. Artificial irrigation will be needed for the foreseeable future, possibly long term. Site will probably be free from direct future development (onsite) but will likely be subject to significant increases in land use threats (upstream or adjacent influences).

Poor – The mitigation site is unlikely to exist in perpetuity and may have an existing or potential threat to onsite development. The site is not expected to survive without continued artificial irrigation and active management, but neither practice is expected to persist. Significant increases in land use threats (upstream or adjacent influences) are expected.

Plants Survive Without Artificial Irrigation?

<u>Rationale:</u> Wetlands and riparian areas occur in places where the natural hydrology yields enough water for their development and persistence. In some circumstances permanent structures (e.g. diversions) can be installed which create the appropriate hydrology for wetland or riparian habitat development in places where they did not exist previously. Provided that these water sources are persistent (i.e. cannot be turned off by a valve), they are not considered artificial watering. But water delivered through valves, delivery pipes, sprinklers and/or drip systems which can be shut off at any time are considered artificial. Encroachment by upland species due to lack of water can be considered and may lower the score.

Relative to the above rationale and reference condition, and while irrigation may have been used for initial plant development, the potential for plants will survive without artificial watering is:

Optimal – 75-100% of the site has the appropriate hydrology or soil type for persistence of the target vegetation and will not require continued artificial watering applications, but the remainder does not. The loss of planted individuals due to lack of water is minimal. A lower score should be given if the targeted plantings were not representative of the reference condition (too many upland individuals).

Sub-Optimal – 50-75% of the site has the appropriate hydrology or soil type for persistence of the target vegetation and will not require continued artificial watering applications, but the remainder does not. Some loss of planted individuals due to lack of water may be evident. A lower score should be given if the targeted plantings were not representative of the reference condition (too many upland individuals).

Marginal – 25-50% of the site has the appropriate hydrology or soil type for persistence of the target vegetation and will not require continued artificial watering applications, but the remainder does not. Some loss of planted individuals due to lack of water may be evident. A lower score should be given if the targeted plantings were not representative of the reference condition (too many upland individuals).

Poor – Very little (0-25%) of the site has the appropriate hydrology or soil type for persistence of the target vegetation so substantial artificial watering will be necessary over the long term. Loss of planted individuals due to lack of water may be common. A lower score should be given if the targeted plantings were not representative of the reference condition (too many upland individuals).

Total Native Plant % Cover

Rationale: Total plant % cover at the mitigation site should be assessed only within that portion of the site where it is appropriate to do so. For example, the area covered by open water in a stream or lake should not be included unless it would be expected from the reference condition (a narrow stream in a steep canyon may normally have tree cover, whereas a wide low gradient stream may not, and bedrock or boulder/cobble habitats wouldn't be expected to have much low cover). All layers of the vegetation structure are integrated into this single metric.

Relative to the above rationale and reference condition, the cover of native vegetation at the site is:

Optimal – 75-100% of the site is covered by native vegetation.

Sub-Optimal – 50-75% of the site is covered by native vegetation.

Marginal – 25-50% of the site is covered by native vegetation.

Poor – 0-25% of the site is covered by native vegetation.

Total Non-Native Plant % Cover

Rationale: Total plant % cover at the mitigation site should be assessed only within that portion of the site where it is appropriate to do so. For example, the area covered by open water in a stream or lake should not be included unless it would be expected from the reference condition (a narrow stream in a steep canyon may normally have tree cover, whereas a wide low gradient stream may not, and bedrock or boulder/cobble habitats wouldn't be expected to have much low cover). All layers of the vegetation structure are integrated into this single metric.

Relative to the above rationale and reference condition, the cover of non-native vegetation at the site is:

Optimal – 0-25% of the site is covered by non-native vegetation.

Sub-Optimal – 25-50% of the site is covered by non-native vegetation.

Marginal – 50-75% of the site is covered by non-native vegetation.

Poor – 75-100% of the site is covered by non-native vegetation.

Plant Density

Rationale: Only shrubs and trees are included here. It is not feasible to include grasses and herbs in density evaluations because discrete individuals are difficult to discern. For wetland types that are naturally dominated by non-discrete vegetation, such as estuarine wetlands, this metric does not apply. Even with trees and shrubs, density evaluations are difficult because of the wide variation present in natural communities. Some natural communities such as riparian scrub have naturally low tree density and others such as mature live oak stands have naturally low shrub density underneath the canopy. For this metric one must carefully consider the reference or target habitat and determine if the mitigation site achieves that target. Shrub and tree species may be considered separately, but then they are combined for this evaluation. Non-natives should be included here as well. This evaluation should only include that portion of the site where shrub and tree presence is relevant and expected.

Relative to the above rationale and reference condition, the density of shrubs and trees at the site is:

Optimal – Combined shrub and tree density is 75-100% of that found in reference or target community.

Sub-Optimal – Combined shrub and tree density is 50-75% of that found in reference or target community.

Marginal – Combined shrub and tree density is 25-50%% of that found in reference or target community.

Poor – Combined shrub and tree density is 0-25% of that found in reference or target community.

Plant Diversity

Rationale: All plant categories are included here, not just shrubs and trees. As with density, plant diversity evaluations are difficult because of the wide variation present in natural communities. For this metric one must carefully consider the reference or target habitat and determine if the mitigation site achieves that target. All plant categories and species should be considered together for this evaluation. Both terrestrial and aquatic vegetation are considered. Non-natives should be included here as well.

Relative to the above rationale and reference condition, the diversity of plants at the site is:

Optimal – Combined plant diversity is 75-100% of that found in reference or target community.

Sub-Optimal – Combined plant diversity is 50-75% of that found in reference or target community.

Marginal – Combined plant diversity is 25-50%% of that found in reference or target community.

Poor – Combined plant diversity is 0-25% of that found in reference or target community.

Arundo donax % Cover

Rationale: In many southern California wetlands and riparian areas, Arundo donax is a particularly harmful invasive plant that can exert an overwhelming influence on the environmental quality of a site. For this reason we pay specific attention to it here. This evaluation should only include that portion of the site where *Arundo donax* presence is relevant and expected

Relative to the above rationale and reference condition, the cover of *Arundo donax* at the site is:

Optimal – 0-25% of the site is covered by *Arundo donax*.

Sub-Optimal – 25-50% of the site is covered by *Arundo donax*.

Marginal – 50-75% of the site is covered by *Arundo donax*.

Poor – 75-100% of the site is covered by *Arundo donax*.

Impervious Substrate

Rationale: Impervious substrates such as asphalt, concrete, and other artificial construction materials have a significant negative influence on wetlands and riparian areas for at least two reasons. First, these materials prevent infiltration of precipitation and other accumulations of water which leads to more flash flood/runoff events which can in turn alter the geomorphology of stream courses and wetlands. Second, these materials tend to accumulate harmful sediment and human induced chemicals which are picked up by runoff and brought to aquatic sites impairing water quality. Highly compacted fill or other materials can be considered partially impervious, so their presence may downgrade the score to some extent. For this evaluation one should consider the influence of impervious substrate not just within the boundries of the site, but also within the surrounding area and the upstream catchment to the extent that those affected areas would have an influence on the site.

Relative to the above rationale and reference condition, the diversity of plants at the site is:

Optimal – Site and surrounding areas and upstream drainages are mostly natural, open space, or range land with little to no impervious substrate, or impervious areas upstream are far enough away that their influence on the site is negligible. Nearby rural residential areas with low impact roads may fall within this category depending on their proximity and drainage characteristics, but would score lower within the category. Sites can still be considered optimal if a minor to significant of highly compacted fill is present at the mitigation site, but this would result in a lower score within the category.

Sub-Optimal – Impervious substrate exists within the site, surrounding area, or upstream drainages, but their influence on the site is low to moderate. Highways and artery roads may be close-by but most of the surrounding area consists of open areas, rural residential or small and/or low density single family residential developments. Highly compacted fill onsite may lower the score according to its extent.

Marginal – Impervious substrate are common within the site, surrounding area, or upstream drainages, and their influence on the site is moderate to significant. Large medium-density or smaller high density single family residential developments may be present, but a modest amount of open space remains as well. Minor commercial/industrial facilities may be present. Highly compacted fill onsite may lower the score according to its extent.

Poor – Impervious substrate are extensive within the site, surrounding area, or upstream drainages, and their influence on the site is significant to severe. Large medium to high density single family residential developments are common, and commercial/industrial facilities may be present to widespread. Very little open space remains. Highly compacted fill onsite may lower the score according to its extent.

"Wetland Indicators" Assessment

Hydrology

Optimal – Greater than 75% of said area is currently experiencing periods of prolonged saturation.

Sub-Optimal – Less than 75% of said area currently experiences saturation, but most (Greater than 75%) of the area has the potential for it to develop in the future.

Marginal – Less than 15% of said area currently experiences saturation, and much of the area (15-75%) lacks the future potential.

Poor – Little to no saturation currently exists, and less than 15% of said area has any future potential.

Hydric Soils

Optimal – Greater than 75% of said area currently contains hydric soils.

Sub-Optimal – Less than 75% of said area currently contains hydric soil, but most (greater than 75%) of the area has the potential for it to develop in the future.

Marginal – Less than 15% of said area currently contains hydric soils, and much of the area (15-75%) lacks the future potential.

Poor – Little to no hydric soils currently exist, and less than 15% of said area has any future potential.

Hydrophytic Vegetation

Optimal – Greater than 75% of said area currently contains obligate or facultative hydrophytic vegetation.

Sub-Optimal – Less than 75% of said area currently contains obligate or facultative plant species, but most (greater than 75%) of the area has the potential for them to develop in the future.

Marginal – Less than 15% of said area currently contains obligate or facultative plant species, and much of the area (15-75%) lacks the future potential.

Poor – Little to no obligate or facultative plant species currently exist, and less than 15% of said area has any future potential.

10.3. Appendix 3: Condensed habitat-type categories

Habitat types cited in 401 permits under impacts or mitigation were consolidated into more general categories to create figures comparing habitat types impacted and required for mitigation. These groupings are shown in Table 35.

Table 35. Condensed habitat type categories.

Habitat Type	Condensed Habitat Categories
Alluvial Scrub	Terrestrial
Chaparral	Terrestrial
Coastal Dune	Terrestrial
Coastal Sage Scrub	Terrestrial
Coastal Scrub	Terrestrial
Estuary	Tidal
In-lieu Fees	In-lieu Fees
Isolated Waters	Other Wetland
Lake	Other Wetland
Marsh Wetland	Other Wetland
Non-distinguished Wetland	Other Wetland
Non-wetland habitat	Unspecified Waters
Non-wetland waters	Unspecified Waters
oak Woodland	Terrestrial
Ocean	Tidal
Open Space	Terrestrial
other	Other
Riparian	Riparian
Seasonal Wetland	Other Wetland
Streambed	Streambed
Tidal Salt Marsh	Tidal
Tidal Wetland	Tidal
Unspecified Waters	Unspecified Waters
Unvegetated Streambed	Unvegetated Streambed
Upland	Terrestrial
Vegetated Streambed	Vegetated Streambed

10.4. Appendix 4: Digital photos with reference locations

The second set of digital photos (submitted as deliverables) consists of a representative photo from each mitigation site evaluated and a description of each of these photos (Table 36).

Table 36. Digital pictures with reference locations and descriptions.

File #	Mitigation Site #	Date Visited	Location	Brief Description of Picture
91-02	1	4/1/2004	Ventura County, Conejo Creek, 5.5 mi upstream of Calleguas Creek	Mitigation site on the northeast bank of Conejo Creek between the creek on the eastern edge and Leisure Village on the western edge.
92-04	1	4/7/2004	City of Thousand Oaks, Ventura Co.	Picture of the mitigation site which was a vegetated streambed and riparian area upstream and downstream of a road.
92-10	1	3/8/2004	City of Simi Valley, Ventura Co.	Picture of the mitigation site which included the riparian area and vegetated streambed at the base of the re-contoured slopes.
92-11	1	4/2/2004	Malibu Lagoon Bridge	Mitigation site on the banks of Malibu Lagoon downstream of the new bridge on Highway 1.
93-06	1	3/11/2004	Morrison Ranch, Agoura Hills, Los Angeles Co.	Mitigation site which was a vegetated streambed surrounded by lawn.
93-09	1	4/23/2004	SW of Antelope Freeway (State Route 14) and Golden State Freeway (Interstate 5), Los Angeles Co	Mitigation area--a naturally vegetated canyon with a concrete-lined box channel and adjacent gravel access roads running through the middle of the site which was located in the lower Arroyo Seco natural park in Pasadena between the Colorado Street Bridge and the La Loma Ave. Bridge.
93-09	2	4/23/2004	SW of Antelope Freeway (State Route 14) and Golden State Freeway (Interstate 5), Los Angeles Co	Mitigation area—created wetlands adjacent to concrete-lined channel in the lower Arroyo Seco natural park in Pasadena between the Colorado Street Bridge and the La Loma Ave. Bridge.

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93-15	1	3/25/2004	Rowland Heights, Los Angeles County	Upstream edge of the primary mitigation site--a created wetland at the lower edge of the development.
93-15	2	3/25/2004	Rowland Heights, Los Angeles County	Downslope edge of second riparian enhancement mitigation site.
93-15	3	3/25/2004	Rowland Heights, Los Angeles County	Downstream portion of oak woodland area designated as preserve.
93-15	4	3/25/2004	Rowland Heights, Los Angeles County	Western edge of riparian enhancement area including slopes in foreground and below the houses.
93-19	1	4/2/2004	Playa Vista, LA Co.	Eastern edge of created wetland mitigation site located south of Jefferson Blvd. and west of Lincoln Blvd across from the new housing development.
94-03	1	3/8/2004	Near the SV Wastewater Treatment Plant, Arroyo Simi, Ventura Co	Mitigation site within Arroyo Simi River channel.
94-03	2	3/8/2004	Near the SV Wastewater Treatment Plant, Arroyo Simi, Ventura Co	General location of second mitigation site 1.1 miles downstream of first site around a bend in the Arroyo Simi River; specific boundaries of the mitigation site could not be determined.
94-09	1	4/8/2004	Ventura Co.	General location of mitigation site in Boulder Creek upstream of the Sycamore Ave Bridge along Boulder Creek; specific boundaries of the mitigation site could not be determined.
95-003	1	4/27/2004	South of SR-60 (Pomona Fwy) and West of Chino Hills Parkway, Diamon Bar, Los Angeles Co	Downstream portion of mitigation area.
95-02	1	4/21/2004	N of City of Agoura Hills, Adjacent the W border Jordan Ranch, in SMMNRA, 4 mi N FWY 101, Ventura Co	Mitigation area within riparian/park area surrounding Medea Creek.
95-02	2	4/21/2004	N of City of Agoura Hills, Adjacent the W border Jordan Ranch, in SMMNRA, 4 mi N FWY 101, Ventura Co	Mitigation area in a steep upland canyon below the water storage tank used by the new development.
95-04	1	4/9/2004	Tick Canyon Bridge, Route 14, Santa Clarita Valley, Los Angeles Co	Upstream portion of mitigation area in Tick Canyon adjacent to Route 14.
95-062	1	4/19/2004	Route 150, 1.6 Miles from Ventua-Santa Barbara County Line, Ventura Co.	Mitigation area south of Route 150 consisting of slope, riparian area, and streambed.
95-07	1	3/30/2004	on Route 605, South of Route 10, West Covina, Los Angeles Co	Mitigation area south of Highway 605 in and on banks of Walnut Creek channel.

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95-08	1	4/6/2004	Thousand Oaks, Ventura County	Downstream portion of mitigation site including detention basin.
95-08	2	4/6/2004	Thousand Oaks, Ventura County	Upstream portion of mitigation site with riparian vegetation.
95-08	3	4/6/2004	Thousand Oaks, Ventura County	Upstream edge of mitigation site beginning at the concrete outflow extending to the road through steep chaparral canyon.
95-08	4	4/6/2004	Thousand Oaks, Ventura County	Downstream of mitigation site located in steep chaparral canyon.
95-091	1	4/13/2004	Borchard Road/Route 101 Freeway Interchange, Newbury Park, Thousand Oaks, Ventura County	Wetland sites in flat portions of basins consisting of grouted rip-rap.
95-091	2	4/13/2004	Borchard Road/Route 101 Freeway Interchange, Newbury Park, Thousand Oaks, Ventura County	Upland planting areas surrounding flat portions of basins.
95-119	1	4/14/2004	South of Simi Valley Freeway (118) and West of Tapo Road, Simi Valley, Ventura Co.	Detention basin.
95-119	2	4/14/2004	South of Simi Valley Freeway (118) and West of Tapo Road, Simi Valley, Ventura Co.	Strip of willow cuttings planted at foot of southern bank of Arroyo Simi north of new housing development.
95-119	3	4/14/2004	South of Simi Valley Freeway (118) and West of Tapo Road, Simi Valley, Ventura Co.	Detention basin.
96-086	1	4/13/2004	Beneath Bouquet Canyon Rd and at Valencia Blvd bridge, City of Santa Clarita, Los Angeles CO.	Revegetated banks along Soledad Canyon Road—boundaries could not be determined clearly.
96-086	2	4/13/2004	Beneath Bouquet Canyon Rd and at Valencia Blvd bridge, City of Santa Clarita, Los Angeles CO.	Area where *Arundo donax* was removed located immediately south of the Valencia Blvd Bridge crossing.
96-086	3	4/13/2004	Beneath Bouquet Canyon Rd and at Valencia Blvd bridge, City of Santa Clarita, Los Angeles CO.	Area to be revegetated downstream of the bridge expansion on Valencia Blvd.
96-102	1	4/20/2004	Naval Air Weapons Station, Point Mugu, Ventura Co.	L1R restoration site where an intertidal mudflat and tidal salt marsh habitat have been restored.
97-080	1	4/14/2004	Mount Sinai Memorial Park,Simi Valley, Ventura Co.	One of two large detention basins that were created adjacent to the memorial park and planted with native riparian and wetland species.
97-088	1	4/8/2004	Unincorporated area of Ventura Co, 4.8 Mi E of Santa Paula, 1.7 Mi N of route 126, b/t SntPla & Flmr	Mitigation area on eastern banks of O'Leary Creek where a variety of native upland chaparral species, some of which were riparian, were planted in site 1, the upper section of the mitigation area.
97-088	2	4/8/2004	Unincorporated area of Ventura Co, 4.8 Mi E of Santa Paula, 1.7 Mi N of route 126, b/t SntPla & Flmr	The lower portion of the mitigation area, was closer to the stream channel and also planted with native chaparral species, some of which were riparian.

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97-103	1	4/28/2004	City of Camarillo, Ventura Co.	Long Canyon/Grimes Canyon mitigation area where the banks were stabilized with various erosion-control materials and replanted with native grasses.
97-103	2	4/28/2004	City of Camarillo, Ventura Co.	Downstream portion of Shekkel Canyon mitigation site which consisted of over one mile of stream restoration north of the Grimes Canyon Road crossing.
97-129	1	3/18/2004	Santa Fe Reservoir Spreading Grounds, Ciry of Irwindale	Revegetation that took place on detention basin slopes and has spread (propagated naturally) into lower basin bottoms and in the drier basins.
97-129	3	3/18/2004	Santa Fe Reservoir Spreading Grounds, Ciry of Irwindale	Mitigation area consisting of a monostand of oleander along Duarte Rd.
97-133	1	4/28/2004	City of Camarillo, Ventura County	(see 97-103 site 1: same mitigation site)
97-133	2	4/28/2004	City of Camarillo, Ventura County	(see 97-103 site 2: same mitigation site)
97-170	1	4/2/2004	Santa Clara River, Del Valle, LA Co	Mitigation area consisting of willow cuttings planted on top of and downstream of the three rip-rap groins constructed along the southern banks of the Santa Clara River.
97-175	1	4/8/2004	Ventura Co., Fillmore area, 4.5 miles east of Santa Paula	One of seven areas between the southern edge of the Valley Crest Tree production area and the Santa Clara River where *Arundo donax* was removed.
97-203	1	4/21/2003	Sunland-Tujunga Area, Los Angeles Co.	The top detention basin which was sandwiched between houses and streets and was fenced off from the open space where native vegetation was planted on the banks.
97-203	2	4/21/2003	Sunland-Tujunga Area, Los Angeles Co.	The lower detention basin located below the development where native vegetation was also planted on the banks.
98-015	1	5/6/2004	Arroyo Conejo Creek, City of Thousand Oaks, in Ventura County	One of the streamside terrace mitigation sites in Arroyo Conejo Canyon.
98-015	2	5/6/2004	Arroyo Conejo Creek, City of Thousand Oaks, in Ventura County	One of the stream wash sites in Arroyo Conejo Canyon.
98-015	3	5/6/2004	Arroyo Conejo Creek, City of Thousand Oaks, in Ventura County	A bank of Arroyo Conejo Canyon reinforced with armor flex blocking and planted with willow cuttings.
98-018	1	4/9/2004	City of Santa Clarita, Los Angeles Co	Enhancement of riparian area north of Pico Canyon Rd that appears to drain runoff from the housing development located immediately south of Pico Canyon Rd.

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98-032	1	4/6/2004	Camarillo, Ventura	A wetland at the edge of which a road for the golf course was built in the northwestern corner of the golf course associated with the housing development.
98-032	2	4/6/2004	Camarillo, Ventura	An upland strip of land in a riparian corridor along the road at the northern edge of the housing development where native riparian species were planted.
98-072	1	5/12/2004	Northwest of Calabasas, Los Angeles Co	A canyon located southwest of the new housing development where there is an existing riparian and streambed habitat with mature willows, oaks and cottonwoods.
98-112	1	3/15/2003	City of Westlake Village, Los Angeles Co	Revegetated detention basin slopes and bottom.
98-112	2	3/15/2003	City of Westlake Village, Los Angeles Co	Mitigation area south of an existing wetland.
98-112	3	3/15/2003	City of Westlake Village, Los Angeles Co	Riparian corridor mitigation area.
98-196	1	4/29/2004	Point Mugu, Ventura Co.	(see 00-127: same mitigation site)
99-006	1	4/14/2004	Simi Valley, Ventura Co	The edge of the 17-acre mitigation area consisting of riparian, wetland, and lake habitat created onsite with the earthen dam in the background.
99-026	1	5/4/2004	San Francisquito Creek, City of Santa Clarita, LA	Mitigation site located onsite along the banks of the Scott Ave Bridge in San Francisquito Creek.
99-026	2	5/4/2004	San Francisquito Creek, City of Santa Clarita, LA	Mitigation site located upstream of the Newhall Ranch Rd. Bridge.
99-026	3	5/4/2004	San Francisquito Creek, City of Santa Clarita, LA	Mitigation site located near the confluence of the Santa Clara River and San Francisquito Creek.
99-037	1	4/19/2004	Lake Casitas and Coyote Creek, Ventura Co.	The wetland mitigation area which involved construction of a meandering base flow channel though the area and planting wetland/riparian species along that channel and throughout the old impoundment.
99-037	2	4/19/2004	Lake Casitas and Coyote Creek, Ventura Co.	Enhanced riparian area upstream of wetland mitigation area south of the road.
99-045	1	4/14/2004	City of Simi Valley, Ventura Co.	Arroyo Simi channel where *Arundo* and castor bean were to be removed.
99-054	1	5/4/2004	City of Santa Clarita, LA Co	Downstream edge of mitigation area including the detention basin.

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99-055	1	5/6/2004	City of Thousand Oaks, Ventura Co	Main mitigation area for this project--a portion of a newly created wetland down-slope of HCTP between the confluences of the Arroyo Conejo and the N. Fork.
99-055	2	5/6/2004	City of Thousand Oaks, Ventura Co	Mitigation site—planting areas above rip-rap on both banks of the north fork of Arroyo Conejo (Conejo Creek) where it runs along the Hill Canyon Treatment Plant.
99-100	1	5/5/2004	Sorenson Avenue Drain, City of Whittier, Los Angeles Co	Mitigation site in the Bosque Del Rio Hondo Nature area in the Whittier Narrows within which specific mitigation area is located.

10.5. Appendix 5: Site Narratives

This appendix presents brief narratives of each of the mitigation sites surveyed in the field. The narratives are presented in the order of their permit numbers (or numbers assigned by us if there was no formal number for the permit). Each narrative is written in roughly the following format:

1) Description of mitigation project sites and habitats
2) Description of biological features
   - presence of wetlands
   - type of vegetation at herb, shrub, and tree layer, cover and abundance, dominant species, debris (coarse woody and fine)
3) Description of general physical features
   - topography/slope
   - onsite hydrology
   - geomorphology
4) General landscape context
   - surrounding land use (immediate and greater vicinity)
   - position in and hydrological connection to watershed
   - buffered vs. non-buffered areas
5) Additional information

91-02 Conejo Creek Streambank Protection Project, Ventura

The impact project was reconstruction of an eroded bank with grouted stone to protect it from further erosion. The impacts are assumed to be in part to protect a nearby road from future erosion damage at the creek bend. The impact site will result in permanent impervious substrate being placed within the creek and the permanent loss of vegetated habitat along the grouted section. Required mitigation was enhancement of the eastern bank of an area downstream of the impact site by planting willow cuttings. The mitigation site was directly behind the Leisure Village housing complex. The boundaries of the enhancement area could not be determined because the vegetation upstream and downstream of the site delineated on the map was the same and included willow which was the plant specified for the revegetation effort. Initially, we thought that the restorative plantings (mitigation) occurred on the southeastern bank of Conejo Creek After more careful review of the permit and aerial photos, we determined that the mitigation efforts were to occur on the northwestern bank of Conejo Creek, between the creek and Leisure Village. All field assessments were updated to reflect the change in mitigation area. Boundaries of the redefined mitigation site could not be determined either.

There was minimal presence of willows within the vicinity of the mitigation area. This condition may be due to scouring effects that occurred over time in the creek coupled with the low elevation of the northwestern bank site. Vegetation within the reach appears relatively undisturbed; however, there is a significant presence of *Arundo donax* on the southeastern bank intermixed with mature cottonwood and willow trees. A debris layer is present and in various states of decomposition, though lacking large woody debris since there are few mature trees within the mitigation site. Vegetated streambed and riparian habitat is present, but not wetlands.

Topography is moderately complex. Soils vary from sand to small cobbles and a few larger rocks. The stream was flowing at low-volume at the time of assessment. The channel exhibited a complex array of pools, eddies and scour pits.

The mitigation area is somewhat influenced by impervious substrate found along the northwestern bank protecting a Flood Control Access road that runs along the Leisure Village complex. Agricultural row crops border the far side of the creek. Downstream of the mitigation site there is increased urban residential development. This site was located in the lower reaches of the watershed.

92-04 Residential Development Project, Raznick Realty Group, Thousand Oaks

The impact project was construction of a large housing development that would impact a stream. Required mitigation was creation and enhancement of a vegetated drainage area within the housing development. The mitigation site that we evaluated was a vegetated streambed and riparian area upstream and downstream of a road. We calculated the acreage of both areas and assessed them as one site because enhancement areas were indistinguishable from creation areas. The armorflex banks on the northern side of the downstream section of the area were not included in the acreage calculation since they appeared to be installed as erosion control and stabilization for the adjacent housing pads rather than a mitigation effort.

The main artificial water source for the area appears to be urban runoff from the housing development, and the drainage is currently wet with flowing, clear water. There are also some irrigation lines in the area, mostly on the higher portions of the banks. Most of the mitigation area is covered by riparian vegetation that is well-established except in one small area where the willow cuttings are still small. Tree cover is very high with dense, well-established willow and cottonwoods present. Shrubs are also common and diverse. There are herbs located along the streambed. Within the drainage channel emergent monocots are present, including large typha stands. Overall, the sites is densely vegetated and adequately supplied with water. Biological debris is very common and includes coarse woody debris. There is debris in various states of decomposition throughout the site.

There is the possibility of biogeochemical services to be provided by this mitigation site through filtration of the runoff due to the flow-through nature of the stream through wetland patches. However, flow volume appears to be too high to allow for significant extraction of pollutants that would be facilitated by water flowing more slowly through the wetland areas. The stream meanders through the mitigation site and there is a good variety of topographic features. The stream reach is low-slope.

The mitigation site was completely surrounded within the housing development. Downstream of the site, there is also dense residential development. Much farther upstream, there are undeveloped chaparral-covered hillsides. This site was located in the mid-upper watershed. There is little commercial development in the greater project vicinity and no industry.

92-10 Tierra Rejada Landfill, Arroyo Simi, Simi Valley

The project impacts were completed to prevent further slope erosion of the Tierra Rejada Landfill. Erosion-control impacts included placing a buttress and a grouted riprap slope along the banks of the Arroyo Simi. In addition, the channel was widened and sediment was removed for use as back fill. A total of 10.7 acres were impacted. Mitigation efforts included re-contouring the stream bottom to lower sections into the floodplain in order to favor revegetation. Perhaps since this permit is several years old, clear evidence that mitigation was actually undertaken at the mitigation site was lacking.

The habitats present included riparian and vegetated streambed. There are not any wetland areas within the mitigation site. Exotic removal occurred over the 12 acres of the mitigation site and the entire acreage was restored with native plants. There was a strong presence of native and non-native plants including mulefat, *Arundo donax*, castor bean and willow. Leaf litter and debris was high, including woody debris. All vegetation was well-established (in all three layers) and very dense. Tree cover dominated the site. While the area was densely vegetated and home to abundant wildlife, this condition could not be positively attributed to mitigation efforts from over 10 years prior. Due to this uncertainty and the lack of evidence of mitigation in the form of exotic removal or restorative planting, GPS boundaries could not be determined.

The physical structures are very diverse in part because this mitigation site is large. There is an active channel with medium flow onsite. The channel has clearly migrated and meandered since the project was initially undertaken. There are in-channel bars, islands, and several tributary channels that diverge from the main channel. The soil is primarily sandy and the slope of the area is low.

The Tierra Rejada Landfill and the water treatment plant that are immediately adjacent to the mitigation site are part of the surrounding land use. There is some natural buffered region around the mitigation site, but this vegetation is not entirely native. Upstream, there is a combination of residential and commercial development. Downstream, there is a concrete mixing company and other industrial services. This site was located in the lower watershed of Simi Valley. The mitigation site is highly impacted by development as well as the water flowing through the site.

92-11 Malibu Lagoon Bridge Replacement, Malibu

The impact project was replacement of the bridge over the Malibu Lagoon for Highway 1. Impacts would include placing new bridge supports within the lagoon channel and impacts to the adjacent lagoon banks from building a new, wider bridge. Required mitigation was replanting of vegetation in areas onsite impacted by construction. A more recent, unrelated habitat restoration project involving revegetation with native plants was undertaken in a large area around the bridge overlapping the mitigation site. The restoration for this file was indistinguishable from the plantings associated with that restoration project. Therefore, it was impossible to determine if mitigation was undertaken for the bridge replacement permit. Any shortcomings of the mitigation effort were obscured by the successful habitat restoration effort that followed. We evaluated the areas in the vicinity of the bridge despite the fact that we could not determine exact boundaries for the mitigation area and much of the habitat we surveyed was included in the more recent Malibu Lagoon restoration.

There was a wide variety of native salt marsh, riparian and upland species in the area. Much of the vegetation was mature and well-established, implying that restoration efforts (either via mitigation of the restoration project) occurred several years ago and were successful. The tree layer was present though not extensive. There were well-established species and younger sycamores planted within the mitigation area. The herb layer, in particular salt marsh plants, was abundant and dense near the open lagoon water. The shrub layer exhibited the most complexity and the highest density of all the plant layers and accounted for the majority of the vegetation cover. Saltbush, laurel sumac, and others were present in this category. Invasive plants were virtually absent. Leaf litter and debris were abundant, though woody debris was not common. Several aquatic birds were seen onsite.

The lagoon mouth was closed at the time of field assessment. Hydrology seemed adequate to support the riparian and salt marsh species present. There was little topographic complexity to the channel near the bridge; the site consisted of a primarily straight channel until farther downstream near the lagoon mouth.

Surrounding land supported a commercial center, medium-density traffic, a golf course, single-family residences and open space. The canyon upstream of the site was relatively undeveloped. However, much of the water traveling downstream was most likely impacted by urban development in the floodplain of Malibu Creek. The area immediately around the mitigation area has substantial buffer upstream and outwards towards the Pacific Ocean. In addition, the Malibu Lagoon restoration project enhanced a section of buffer immediately southwest of the mitigation site. This site was located at the base of the watershed.

93-06 Medea Creek Restoration, Agoura Hills

The project involved removing a non-permitted area of a trapezoidally lined concrete stream, and restoring it to natural conditions. As such the impact project was considered to be the original concrete installation and the mitigation was the restoration back to original streambed habitat. The mitigation also included widening the channel and shallowing the slopes of the bank.

In all, this was a very good restoration resulting in good habitat and proper hydrology and wetland habitat. There was some question as to whether the green belt along the left side of the channel was included in the mitigation acreage. This greenbelt was a complication in the CRAM evaluation that did not include it as buffer. We did include it as buffer in our UCLA CRAM evaluation. The channel was densely covered in riparian vegetation with dense willow trees, good typha and emergent habitat, etc. Wetland, vegetated streambed, riparian and upland areas were present onsite. Leaf litter and debris was abundant, including woody debris and plant material various stages of decomposition. There was a wide variety of wildlife present onsite including rabbits, ducks, hawks, lizards and insects. It was not the best habitat for fish, but some non-natives may have been present.

Some riprap was installed within the mitigation site after the fact, and this was removed from our acreage estimates. Otherwise there was little impervious substrate within the mitigation area. The site did run through culverts under two road crossings. Soils were of high quality. Decomposing plant matter and the flowing stream channel aided soil quality. Overall the site was low-slope and low-flow. The areas of wetland vegetation may have contributed small biogeochemical filtering effects to the stream flow. Since runoff supplies much of the water in this system, the filtering effects may improve the water quality slightly.

The habitat was not a perfect, unaltered stream, but represented a good riparian strip, within an otherwise suburban setting. The buffer was limited to the greenbelt in most cases. All the surrounding land was developed into single-family resident homes. This site was located within the upper watershed.

93-09 Sunshine Canyon Landfill; Arroyo Seco, Pasadena

The impact site was the construction of the Sunshine Canyon Landfill in the Newhall Pass area (near the I5 and SR14 interchange), in which 3.78 acres of wetlands/waters and 4.46 acres of non-jurisdictional riparian habitat would be lost. Mitigation for this lost habitat was offsite in the lower Arroyo Seco natural park in Pasadena between the Colorado Street Bridge and the La Loma Ave. Bridge. Mitigation involved the creation of 4.02 acres of wetlands and 22.4 acres of riparian enhancement. Most of the area consists of a naturally vegetated canyon with a concrete-lined box channel and adjacent gravel access roads running down the middle. There is no above-ground hydrologic connection between the stream and the adjacent "riparian" areas, though the area may get some water from ground water given the geomorphology of the canyon. We considered most of the area riparian for this reason. It was not possible to determine the exact boundaries of this site because the enhancement activities were indistinguishable from the general maintenance activities of this pre-existing park area. Our GPS evaluation overestimated the expected acreage by almost double. Active recreation and management are significant in this public area. Much of the west side of the river was an archery range with crisscrossing paths and the east side contained a large parking lot and a large casting pond. Dog walking is very common in the area. Houses line both sides of the area. The site does not differ significantly from the remainder of the park downstream that was not included in the mitigation. For the wetland mitigation, water was diverted from an impoundment just upstream of the site, and brought by underground pipe to created channels along both sides of the river that meandered within created banks through an otherwise upland/riparian area before draining via culvert back into the river. These channels were densely vegetated with typha and other aquatic vegetation and represents successful wetland creation projects. This was called site 2 and site 1 was the remainder of the site.

93-15 Ridgemoor Residential Development

This project consisted of a large single-family residential development in the Roland Heights hills. Several ephemeral or intermittent streams were filled and piped under the development. A few small areas of wetland habitats were present within the filled stream valleys. About 2.4 acres of jurisdictional wetland/stream habitat were lost. The area was a natural area with good connection to adjacent open spaces. Much of the stream courses were surrounded by oak woodland, but with some cattle-grazed pastureland as well. The streams were medium-gradient and near the top, but not at the top of the drainage. The mitigation was to consist of three separate components: a “wetland” creation, and two separate riparian enhancement areas. The primary mitigation site was the wetland creation that was at the lower edge of the development and was fed by urban runoff from the development. Several portions of the development drained to the mitigation area at different locations within the site. The site was constructed as a series of stepped “house-pad” like basins surrounded by completely by low berms except for small outlet areas on the downstream edges that fed in sequence to the step basin below. A small low-flow sub channel meandered through all of the basins. These basins were filled with dense mulefat, willow and other target vegetation. Wetland conditions were evident closer to the subchannel where wetter conditions have led to hydric soil development, and dense cattails. Further from the sub channel, conditions are drier, but are likely flooded during rain events. This site was clearly delineated by a fence that separated it from a dirt, walking path. The riparian enhancement areas were more problematic. One of these areas consisted of a large and untouched oak/riparian drainage that ran from a newly constructed concrete detention basin to the upper property line. Between this untouched area and the adjacent homes (which surrounded it on three sides), steep compacted hillsides existed which were planted with an appropriate cover of native tree and shrub vegetation. These vegetation plantings were necessary for erosion control of the steep slopes and had little or no hydrological connection to the drainage. Because the natural area and the planted area were fundamentally different habitats these were evaluated separately with the natural area treated as a preservation, and the planted areas treated as the enhancement site. The other riparian enhancement area was to occur within another untouched riparian area along the eastern border of the property. No mitigation site was located in this area. However, at the top of the eastern-most cul-de-sac, some mulefat and other native vegetation were planted on what appeared to be an abandoned house pad. Based on the presence of mulefat and the approximate size of the flat, planted area, we determined that this was considered to be the second riparian enhancement mitigation site. This area had no hydrological connection to any water source other than artificial irrigation.

93-19 Playa Vista Wetland, Ballona Flood Control, Los Angeles

The impact project was construction of Phase I of the Playa Vista housing development. This is a large, several-phase development of a self-contained housing complex, shopping facilities and office buildings located in the Ballona Wetlands area. Required mitigation for Phase I was creation of a riparian corridor (25 acres) and a freshwater marsh (24 acres) onsite adjacent to the housing development, directly west of Lincoln Blvd. At the time of assessment, only the fresh water marsh mitigation had been constructed. We evaluated the freshwater marsh which had boundaries delineated clearly by a nature trail, a dirt road, and a staked footpath. The freshwater marsh was categorized as riverine due to its flow-through nature. The main water source for the area appears to be urban runoff from the new housing development located east of Lincoln Blvd, though it is unclear what will happen to this water source once the housing development is completed. The water flowed slowly through the marsh and exited the mitigation area into the Ballona Wetlands. There was also irrigation. The vegetation, including native riparian and wetland species as well as upland chaparral species, were well-established and there were lots of birds, including redwing blackbirds and white-crowned sparrows, present in the area. The channel of the marsh was densely vegetated with typha and several islands located throughout the marsh also supported typha and wildlife. The entire marsh was surrounded in a buffer habitat ~10m wide that appeared to be hydro seeded with native shrubs and grasses and supported by artificial irrigation. In contrast to the surrounding Ballona Wetlands, the freshwater marsh was populated notably with a wide variety of native plants and visited by several species of wildlife. The lack of invasive species in the freshwater marsh was a stark contrast to the strong presence of *Arundo donax* and castor bean in other parts of the remaining Ballona Wetlands.

94-03 Arroyo Simi Repair of Embankment and Utility Lines

The impact project for this permit involved reconstruction of 525 feet of existing riprap on the north bank of the Arroyo Simi and reconstruction of a buried sewer pipeline crossing on the south side including the replacement of 25 feet of riprap on the south side of the stream. All impacts occurred just south of the Madera Rd. Bridge. A second impact site occurred 1.1 miles downstream of this sewer pipeline replacement. The second impact involved the reconstruction and burial of a reclaimed water pipeline leaving the Sanitation District. Mitigation efforts were to take place onsite at both impact sites and involved restoring conditions within the Arroyo Simi. The upper portion of the first site is located within a channelized and rip-rapped portion of the stream. Only the channel bottom is partially natural in segments which allows for vegetation growth. Mitigation efforts were to include re-vegetation of this impact area primarily with mulefat; however, no evidence of native vegetation was present in the mitigation area upon assessment. This is not unusual even if the required mitigation did occur given that the mitigation site is within the channel itself, and subject to flooding and scouring events that could have naturally removed restorative plantings in the 10 years since this permit was issued. This idea of scouring was supported by the lack of vegetation upstream and downstream of the mitigation site, suggesting that services lost are minimal at the first mitigation site when compared to un-impacted habitat within the same area.

The second mitigation site was 1.1 miles downstream around a bend in the Arroyo Simi. Here, the stream was more natural (i.e. it was no longer channelized and minimally impacted by riprap). At this site, all impacts were considered temporary. Hence, it was difficult to locate the specific impact site. There was no evidence of restorative planting and the mitigation boundaries could not be distinguished from the surrounding habitat. As with the first mitigation site, this second site was very similar to habitats immediately upstream and downstream of the hypothesized mitigation site, suggesting that few habitat services were lost from project impacts. This section of the Arroyo Simi was wide with several channels, bars and island. Trash was common as were invasive *Arundo donax* and castor bean.

94-09 Southern Pacific Milling Excavation Mining, Boulder Creek, Santa Clara River

The impact project was removal of sand and gravel from a vegetated streambed as part of a watercourse-cleanout project. Impacts took place upstream of the Sycamore Ave. Bridge in Boulder Creek. Impacts would have resulted in soil and vegetation disturbances since sand and gravel were removed from the streambed. Required mitigation was replanting of the banks of the river disturbed during the project with native trees and grasses. We evaluated the area delineated on the map, but exact boundaries of the mitigation area could not be determined because the area was indistinguishable from areas upstream. There were no signs of restorative plantings or exotic-plant removal. The streambed was vegetated sparsely with a mix of native and exotic shrubs and herbs with a few trees. Since the mitigation area was indistinguishable from the surrounding habitats immediately upstream and downstream, it is likely that few services were lost from the impacts in the excavation.

95-003 Diamond Ranch High School, Diamond Bar

The impact project was the construction of a new high school near the top of a small knoll in the Chino Hills area. For this project, the head waters area of a small draw was filled to level the area for the construction and the surrounding drainage was impacted by the construction of a large parking lot. A portion of the preexisting draw was shifted south towards the hills. This high-gradient draw served few hydrological functions and moderate habitat function. It was previously mostly ephemeral with no wetland habitat. The mitigation consisted of revegetation plantings within the resulting drainage course which was mostly encompassed by the parking lot with two small portions completely surrounded and connected by pipe. Another tributary from higher up in the hills drained to the lower portion of the site. Due to the way the drainage course was constructed, a small area near the bottom of the drainage inadvertently collects water and a small wetland area (no standing water) was created and some typha exists there. The remainder of the mitigation area has mostly steep slopes with native upland vegetation plantings, but also with a lot of invasive grasses, herbs and shrubs. The site is managed by the school gardeners who mostly leave it alone. Habitat is good for the type of site, but buffer issues are significant. However, not a lot of function was lost by the impact project.

95-02 Oak Park Residential Community

Project consisted of constructing a large single-family residential development in the hills of Agoura in and around ephemeral higher gradient drainage valleys on chaparral-covered hills. Stream courses did not provide much habitat, but represented healthy habitat of its kind with lots of open space, no impervious substrate, etc. Streams are now in pipe under the streets. Mitigation for lost habitat and hydrologic function consisted of two distinct projects. The first (site 1) was to enhance an already existing riparian/park area surrounding Medea Creek by removing exotics and planting riparian and native facultative riparian/upland species. While much of the proposed work was likely done with good survival, some areas had either poor survival or had insufficient planting arrangements, resulting in low-cover densities. It was very difficult to delineate mitigation areas from pre-existing vegetated areas. It is unclear weather the mitigation work resulted in a substantial increase in habitat or other values over what was already there. Much of the planting area was located in places that were marginally connected to the stream hydrology and not subject to any flood regime of the creek, such as above culverted sections or on wide terraces further from the creek. Some subsurface connection may have been present in the area.

The second site (site 2) was in a steep, upland canyon below the water storage tank used by the new development. The mitigation was to have a continuous release of drinking water from a tank drain into the otherwise dry chaparral covered canyon. A buried pipe came to the surface about 40 m below running down the bottom of the draw for 30-40 m and then disappeared. Typha and willow were planted near the water outlet (one small 5-20 m squared patch each). Nothing else was evident. The unnatural, continuous release was down cutting a small (6 inch across) channel underneath the chaparral scrub.

95-04 Tick Canyon Bridge Route 14 Median Widening, Santa Clarita

The impact project was widening the median of Tick Canyon Bridge. The bridge crossed an open stream channel that ran under the bridge. Upstream of the bridge, the stream was channelized and ran under a housing complex, picking up urban run-off. About 50 m from the impact site, the stream surfaced and was no longer channelized. The bridge was previously located across this stream. The project consisted of widening the median and associated bridge supports, thereby impacting the downstream portion of the stream. Required mitigation was removal of exotics (tamarisk and tree tobacco) and replanting of native upland and riparian species onsite. Upstream, the mitigation area boundaries were determined by the presence of another bridge just downstream of where the stream surfaced from the box channel. Downstream, the boundaries were determined by cement in the stream channel marking the property of an industrial operation just south of the mitigation area. Woody vegetation was removed from the area immediately upstream of the bridge. All vegetation with this section of the stream channel was cut down and left in the channel. Judging from the dead brush piled near tree stumps in the streambed, it appears that mature willow trees were removed in addition to the invasive tamarisk and tree tobacco. This apparent removal of mature native willow trees might be a violation of the permit conditions. The upland slopes on the downstream side of the bridge appear to have been planted with chaparral plants though are not clearly connected to the stream's water supply and may suffer from water stress in the future. Both wetland and riparian vegetation are present in the stream channel including the aforementioned willow, typha, and other emergent monocots. The stream is currently running with low volume which is most likely the result of urban runoff from the upstream housing complexes. Downstream of the bridge, the mitigation site has some impervious substrate along with large cobbles and boulders within the channel. The downstream side of the mitigation site leads to what appears to be an industrial mining or excavation facility.

95-062 Casitas Creek Slide, Bank Stabilization and Stream Diversion, Route 150, Ventura

The impact project consisted of repairing a steep road bank to creek drop-off that has been eroded as the stream has migrated towards the road which was on the outside of a turn cut into a steep canyon wall. The impact project occurred in the chaparral scrub habitat. The surrounding land was primarily undeveloped, though there were a few agricultural farms with orchard crops in the lower hillsides and valleys. The repair consisted of dumping a large amount of riprap boulders directly into the narrow stretch filling much or all of the stream channel and extending up the right bank towards the road above. Then, two vertical concrete retaining walls were installed along most of the road embankment (one terraced 8.5 m below the top one) and then the rest of the area was backfilled and revegetated with upland scrub vegetation. Some larger willows come up through the riprap and a few sycamores seem to have been planted, but most vegetation is upland rather than riparian. Most of the mitigation is very steep and not hydrologically appropriate as lost riparian habitat. The widening stream was mostly filled and constricted, so much stream habitat was lost. The stream is currently in a state of disequilibrium and is eroding on the left bank due to riprap. Area above the lower concrete wall terrace has no hydraulic connection to the stream. It was impossible to clearly distinguish the edges of the mitigation boundaries, though close estimates could be made based on the length of the artificial riprap placed in the stream and the length of the retaining walls up the right bank.

95-07 Walnut Creek Bridge Widening, Route 605, West Covina

Project involved installation of an extra lane on the 605 Freeway at the crossing of Walnut Creek. This project involved adding an extra 12 ft or so on each of the ~1ft wide bridge supports and the temporary impacts to the streambed and vegetation due to the tractors in the stream. Mitigation was to include re-contouring the streambed itself; exotic removal and spraying exotics with herbicide; and revegetation with mulefat in the area downstream of the bridge. It was impossible to determine the boundaries of the site, making GPS unfeasible, and whether any mitigation was done given that little to no vegetation was present in the general vicinity of the mitigation site. Exotics were present and mulefat was not present. The required mitigation work was either not done, or was unsuccessful. However, the impacts of the project were minor and included a small footprint of bridge supports and an extra lane of shading to an otherwise degraded section of sandy floodplain. While no effective mitigation was done, only minimal wetland or riparian services were lost due to the project. The stream is equally degraded upstream and downstream of the project site with minimal vegetation and the mitigation site is indistinguishable from its continuous stream reaches. The site is subject to regular flood scour due to heavy urbanization and unconsolidated sediment. The site was completely dry/ devoid of surface water, though surface water is present 0.5 miles upstream for a small section. A section of in-stream mature trees also occurs 0.2-0.5 miles upstream in a mid-channel island. Immediately upstream of the bridge work was underway in the channel with a large (~6ft diameter) flexible pipe traversing the channel.

95-08 Dos Vientos Development, Courtly Homes, Arroyo Conejo, Thousand Oaks

The impact project was construction of a large housing development in chaparral-covered foothills in Thousand Oaks. Several ephemeral stream reaches were impacted by this development including some wetland habitat. Required mitigation was restoration of a riparian area connected to a detention basin and creation of three pocket wetlands onsite. Two of the pocket wetlands were chaparral-covered canyons with urban runoff water flowing into them from culverts at the tops of the slopes. Site 1 consisted of a riparian corridor flowing into a large detention basin. The basin was largely vegetated with wetland species and supported a large variety of wildlife. Site 2 was a riparian area with sufficient pooling to support wetland vegetation in a low-gradient reach. Concreted riprap and free boulders were placed sparingly along the stream bottom. Site 3 was a steep canyon vegetated with chaparral plants where a small channel is being cut in the soil by what appears to be urban runoff flowing into the canyon from a culvert at the top of it; there appears to be insufficient pooling of water to support wetland vegetation--none is present. Site 4 was a canyon vegetated mostly with chaparral plants altered with terraces to allow water to pool and support wetland vegetation. Wetland plants were planted in small dam constructions down the canyon that allowed water to pool slightly and created hydrologic conditions hospitable to wetland species. The pocket wetlands were highly out of placed in the canyon washes in which they were created. The main artificial water source for all of the sites appears to be urban runoff from the housing development along with some irrigation lines on the upper portion of the banks where water from the stream would not reach the plantings under conditions of normal flow. All sites flowed into Site 1 which was the largest mitigation area at the base of the development.

95-091 Borchard Rd/Hwy 101, Thousand Oaks

The impact project was construction of improvements to the access ramps on the south side of Highway 101. Impacted were to a small drainage entering the site from the NW and to existing native vegetation. Required mitigation was creation of a wetland and enhancement of upland habitat onsite. Boundaries of the mitigation areas were clear because they were the slopes and low-lying portions between the highway and its onramps. We mapped the upland and wetland portions of the mitigation areas together, but assessed function only on the wetland. The wetland portions consisted of grouted rip-rap, mostly, and there were only very small amounts of water at the mouth of the culverts to the western edge of the mitigation area. Water was unable to percolate through the concreted bottom of the "wetland" mitigation site and restorative plantings were absent in these portions of the mitigation areas since they could not be planted on the concrete wetland bottom. Native riparian trees were planted on both the upland and wetland portions of the mitigation area. The upland portions of the mitigation area were planted with a mix of native chaparral and non-native plants and the slopes were stabilized with erosion-control netting. Most plants appeared stressed (possibly from inappropriate hydrology), but non-native plantings of ground cover were well-established in the enhancement areas. Several non-native plantings could be found throughout all the mitigation sites associated with this project.

95-119 Housing Development, Royal Oak Partners, 118 Fwy/Tapo Rd, Simi Valley

The impact project was construction of a large housing development and a bridge crossing to provide access to the new neighborhood. Impacts included development on chaparral hillsides and in associated ephemeral drainages. Additionally, the housing development extended down the hillsides to the bank of the Arroyo Simi. Required mitigation was providing an area for regrowth of wetland vegetation within two new detention basins and planting of willow cuttings on the bank of the Arroyo Simi. The main artificial water source for the detention basins was urban runoff from the new housing development. The first basin, site 1, was full of well-established wetland and riparian vegetation and contained water flowing slowly. Water entered the basin through an urban run-off pipe and flowed slowly out of the vegetated basin into the adjacent Arroyo Simi. The basin could provide some biogeochemical services like removing pollutants from the water. It was treated as a flow-through riverine system. The second basin, site 2, did not have any vegetation growing in it. In addition, the basin was almost entirely dry with only a small pool of standing water. The upper banks of the basin were vegetated primarily with non-natives and irrigated to serve as erosion control. The willow cuttings were planted on a small portion of the southern bank of the Arroyo Simi that had been reinforced with erosion-control netting. The cuttings were about 12 inches high and looked to be planted recently. They were only situated from about 1-4 m above the channel bottom and could be exposed to scouring and flood events before they have enough time to develop sufficient roots to withstand these events.

96-086 Santa Clara River Trail, Santa Clarita

The impact project was construction of a bicycle/pedestrian trail to connect two existing trail systems and provide flood protection to an eroded portion of Soledad Canyon Road. Impacts occurred along the Santa Clara Rive floodplain. The area is highly impacted by urban residential and commercial developments so that the majority of the River in this area is encased in a constructed channel where banks have been artificially created and reinforced to contain possible floodwaters. The River was dry at the time of assessment and much of the impacts associated with this project occurred along the outer wash of the riverbed. Required mitigation was revegetation of areas disturbed during construction, clearing of debris and trash, removal of *Arundo donax*, and avoidance of mature cottonwoods onsite. We divided the mitigation areas into three sites. The boundaries of the first mitigation site--revegetated banks along Soledad Canyon Road—could not be determined clearly, so the area mapped could be an underestimate. Mapping was based on an obvious section of revegetation planting located approximately 1000 yards upstream of the Valencia Blvd Bridge crossing along Soledad Canyon Rd. The second mitigation site—an area where *Arundo donax* was removed—had clear boundaries and was located immediately south of the Valencia Blvd bridge crossing. The boundaries of the third mitigation site—an area to be revegetated downstream of the bridge expansion on Valencia Blvd—could not be determined because the vegetation in the area immediately downstream of the bridge could not be distinguished from the vegetation further downstream. Several mature cottonwoods were still standing in the areas described, so we concluded that they were avoided in construction. We could not determine whether debris and trash were removed from the area, but there was some present. Since the Santa Clara River in Santa Clarita is a highly impacted system, the losses from this project's construction did not significantly affect the vegetation of the system. The exception would be the placement of concrete and reinforced banking along the bike trail along Soledad Canyon Rd., where the impervious substrate added the banks has prevented native vegetation growth.

96-102 Mugu Neighborhood Parks, Point Mugu Naval Base

The impact project was construction of residential and recreational facilities, roads, and walkways associated with the Mugu Neighborhood Parks Project. Through this construction, salt marsh and tidal mudflat habitat was impacted and filled within the large marsh system present on the Point Mugu Naval Base. Much of the salt marsh and wetland habitat on the base has been fragmented, filled or polluted by military activities. As such, the construction site was most likely already highly impacted and fragmented habitat. The Naval authorities are currently in the process of restoring much of the wetland and salt marsh habitats in the goal of creating mitigation banks for future base development. UCLA has been contracted by the Navy to oversee restoration efforts at several mitigation sites throughout the Mugu Naval Base. Required mitigation for this file was restoration of an intertidal mudflat and tidal salt marsh habitat at the L1R restoration site area. The mitigation site is located closer to the Pacific Ocean and has greater potential access to tidal flushing and inundation than the impact sites farther inland. This site has undergone monitoring, restorative planting and land re-contouring. Normal tidal flows were re-established at this site by excavating previously placed fill to create appropriate hydrologic conditions for native salt marsh vegetation which has been planted and has become well-established.

97-080 Mount Sinai Memorial Park, Simi Valley

The impact project was construction of a memorial park. Mt. Sinai Memorial Park is situated on the Southeastern border of Simi Valley, adjacent to a residential housing development. Much of the property bordering the Memorial Park is undeveloped foothills covered with grassland and scrub habitat of the chaparral. There are several non-native grasses covering the dry hillsides and scattered native scrub plants. A few canyons uphill on the Memorial Park supported more riparian vegetation with willow trees present along canyon drainages. Required mitigation was restoration of wetland and riparian areas onsite. We evaluated two large detention basins that were created adjacent to the memorial park and were planted with native riparian and wetland species. Boundaries were clear because the area was fenced. The mitigation was successful at creating two large wetland habitats in the basin bottoms that seemed to exceed the natural wetland conditions. The basin bottoms supported dense stands of well-established, healthy typha. This wetland habitat was host to a wide variety of wildlife including red wing black birds. However, mitigation acreage was supposed to not include the basin bottoms since that area may need to be periodically cleared to improve flood-control services. Unfortunately, we had no feasible way to remove the basin bottom acreages from our total acreage measurements since the bottoms of the basins were wet and densely vegetated. Slopes of the detention basins were revegetated with riparian and upland native species. Additional mitigation requirements were establishment of a Riparian Conservation Zone, contribution of an unspecified amount of money to off-site species recovery, conduction of a pre-construction survey for Least Bell's Vireos, and dedication of a large portion of land within the Douglas Ranch Specific Plan for conservation management and open space preservation. We could not determine whether these additional requirements were met.

97-088 Toland Road Landfill Expansion, Santa Paula and Fillmore

The impact project was expansion of the landfill situated in a chaparral foothill region of Santa Paula. Onsite habitats included pocket wetlands, a streambed and associated riparian areas. The landfill expansion would impact wetland habitats associated with O'Leary Creek. Required mitigation was creation and restoration of riparian and wetland habitat. Initially the mitigation site was selected to be adjacent to O'Leary Creek where sufficient water flow from the creak and wetlands near the site could help support native revegetation efforts. However, this water supply was deemed insufficient to support the mitigation site and another more suitable site was selected farther downstream along O'Leary Creek adjacent to a previous mitigation site. We evaluated two sites within this new mitigation area delineated by where native vegetation was planted and by fencing in areas. Both areas were on the eastern banks of O'Leary Creek, but the banks were tall and steep enough that water from the stream would not reach the mitigation sites under conditions of normal flow. A variety of native upland chaparral species, some of which were riparian, were planted in site 1, the upper section of the mitigation area. Site 2, the lower portion of the mitigation area, was closer to the stream channel and also planted with native chaparral species, some of which were riparian. The lower mitigation site (site 2) would have the potential to become saturated during periods of flood and perhaps both sites would be connected hydrologically through sub-surface flow. Both mitigation areas were surrounded by a buffer region that was marked with no trespassing signs. The buffer was composed of primarily well-established upland species.

97-103 Desilting Basin Outlet, Camarillo

The impact project for file 97-103 was construction of a desilting basin outlet associated with a Pardee residential development. The impacts to the natural habitat caused by the construction of an outfall structure along Calleguas Creek included permanent impacts to southern willow scrub and barren waters of the creek wash. Required mitigation for both files 97-103 and 97-133 was payment of in-lieu fees to the Calleguas Creek Watershed Habitat Restoration Account which is managed by the Coastal Conservancy. Funds from these permits were pooled with funds from various other sources and used by the Ventura Resource Conservation District to undertake two stream bank stabilization/restoration projects in the Calleguas Creek Watershed. Both sites were deeply incised canyons with rapidly eroding banks that were threatening adjacent land uses that consist mainly of orchards. Sediment was put into the stream to raise the bottom of the channel and the banks were graded to make them slope more gently. Grouted riprap was used to make several drop structures in the stream channels. At the first site, Long Canyon/Grimes Canyon, the banks were stabilized with various erosion-control materials and replanted with native grasses. Mulefat cuttings were also planted on the banks at a curve in the stream to reinforce the bank further. The streambed was mostly unvegetated sand before and after restoration though the banks were populated with native herbs and grasses after the restoration. In addition, the various methods of erosion control have been successful thus far in retaining the shape of the stream and preventing erosion. At the second site, Shekkel Canyon, the mitigation site was over one mile of stream restoration. Here, less invasive tactics were employed to remove exotics (primarily *Arundo donax* and castor bean) and stabilize the banks. No erosion control matting or blocks were placed along channel banks and there were few drop structures beyond the Grimes Canyon Rd crossing. Erosion is still a problem at this site as are non-native species. The mitigation for Shekkel Canyon is still undergoing monitoring and invasive species removal. The restoration is expected to continue at this site over the next several years.

97-129 Santa Fe Reservoir Spreading Grounds, Irwindale

The impact project involved the reconstruction of several detention basins within the Santa Fe Reservoir Spreading Grounds in order to increase flood storage capacity. The detention basins were improved with concrete conveyance lowered sections to improve water flow between basins, increase storage capacity and increase percolation rates. Impacts were all temporary to 50 acres of Waters of the United States, including 4.8 acres of riparian vegetation. This riparian vegetation was most likely located on detention basin slopes where native vegetation was established. In addition, the entire spreading grounds serve as wetland habitat to aquatic birds and other small wildlife.

The mitigation for the reconstruction of these basins included five different mitigation sites. Of the five designated mitigation sites, only 2 could be positively located. Site #1 revegetation took place on detention basin slopes and has spread (naturally propagated) into lower basin bottoms and in the drier basins. Upper slopes are ~5m above the water level and function as upland. Farther down the slope, there is a riparian strip below the upland, followed by a vegetated streambed habitat and ultimately a small wetland area at the base of the slope. Site #3, the only other mitigation site located, consists of a stand of oleander along Duarte Rd. It is entirely isolated from the hydrology of the reservoir, with several physical barriers separating it from the basins. Oleander is a non-native and was a poor choice for the “shrub” stipulated in the permit to be planted along Duarte Rd. This area should not have been included as a mitigation site.

The biology of the mitigation sites is much better at Site #1 versus Site #2. There are clear habitats of upland, riparian, vegetated streambed, wetland and open water within the detention basins. All the plantings are relatively young with very few trees present. Mostly natives are growing in the site, though there are some invasives such as tree tobacco present. The herb and shrub layers are healthy and well-established with high % cover between the two layers. Large trees are conspicuously absent, and appear not to have been planted during the mitigation efforts. There is moderate debris cover, but no large woody debris present. Near the base of the detention basin slopes, the debris is more decomposed and broken down due to the close proximity to water. Site 2 has been previously described as an extremely poorly vegetated site with little wildlife use.

While this site scores high for flood storage capacity and dissipation services, these functions are were artificially constructed according to the project design. The San Gabriel River is somewhat connected to these basins and, in the event of flood, would result in the filling of the basins with water. Topography is completely artificial, constructed from fill and compaction with steep slopes in order to contain water within the detention basins.

Surrounding land use is poor. The sites are bordered heavily (about 50%) by the intersection of two high-volume freeways. The remaining borders are developed with a hospital complex and warehouses. There is some buffer region around the mitigation sites within the spreading ground property, though this buffer consists of poor quality, compacted soils or riprap which is visited frequently for human recreation uses. Lastly, the area is subject to mining and excavation activities that occur in the vicinity of the mitigation sites.

97-133 Westport Homes, Camarillo

The impact project for file 97-133 was construction of a housing development. Habitat impacts from this project involved filling an intermittent creek with the development property. The creek has been previously disturbed by agricultural activities, stockpiling activities from a previous site development and off-road vehicle use. Much of the surrounding land supports avocado orchards. Required mitigation for both files 97-103 and 97-133 was payment of in-lieu fees to the Calleguas Creek Watershed Habitat Restoration Account, which is managed by the Coastal Conservancy. Funds from these permits were pooled with funds from various other sources and used by the Ventura Resource Conservation District to undertake two stream bank stabilization/restoration projects in the Calleguas Creek Watershed. Both sites were deeply incised canyons with rapidly eroding banks that were threatening adjacent land uses that consist mainly of orchards. Sediment was put into the stream to raise the bottom of the channel and the banks were graded to make them slope more gently. Grouted riprap was used to make several drop structures in the stream channels. At the first site, Long Canyon/Grimes Canyon, the banks were stabilized with various erosion-control materials and replanted with native grasses. Mulefat cuttings were also planted on the banks at a curve in the stream to reinforce the bank further. The streambed was mostly unvegetated sand before and after restoration though the banks were populated with native herbs and grasses after the restoration. In addition, the various methods of erosion control have been successful thus far in retaining the shape of the stream and preventing erosion. At the second site, Shekkel Canyon, the mitigation site was over one mile of stream restoration. Here, less invasive tactics were employed to remove exotics (primarily *Arundo donax* and castor bean) and stabilize the banks. No erosion control matting or blocks were placed along channel banks and there were few drop structures beyond the Grimes Canyon Rd crossing. Erosion is still a problem at this site as are non-native species. The mitigation for Shekkel Canyon is still undergoing monitoring and invasive species removal. The restoration is expected to continue at this site over the next several years.

97-152 Royal-Madera Shopping Center, Simi Valley

The impact project was construction of a shopping and recreational center. Required mitigation was payment of in-lieu fees to the Calleguas Creek Watershed Habitat Restoration Account managed by the Coastal Conservancy. According to Peter Brand of the Coastal Conservancy who manages that account, the funds have been paid, but not used for mitigation yet. This file was not assessed in the field for function. Rather, it was evaluated solely on 401 permit compliance and is part of the "fifty-plus" category of our analysis.

97-170 Proposed Construction of Groins in the Santa Clara River, Del Valle

The impact project was construction of three groins (piles of rip-rap) on the southern bank of the Santa Clara River to protect a dirt road and adjacent row-crop farmland south of the river from erosion. The Santa Clara River in the Del Valle region is surrounded by agricultural fields of Newhall Land on the southern bank and borders Telegraph Rd on the northern bank. The stream is in a relatively natural state with a wide flood plain and associated river washes and tributaries free from channelization. However, series of drop structures exist in this section of the river and there is a large input of run-off from the agricultural row crops and orchards that are nearby. The river was flowing at low to medium volume at the time of assessment. In order to protect the agricultural fields on the southern bank near the current flow channel, groins were installed along this bank. The groins were approximately 2 meters wide, 2 meters high and 20 meters long stretching outwards from the bank towards the middle of the stream. Required mitigation was planting of willow cuttings on top and downstream of the groins. The areas upstream and downstream of the groins are indistinguishable from the areas immediately downstream of the groins because the same vegetation (e.g. *Arundo*, willow, mulefat) was growing in all of the areas, so boundaries of the mitigation areas could not be determined. The tops of the groins were vegetated patchily with the same vegetation as the surrounding areas possibly due to difficulty of growing atop riprap with limited access to soil. The plantings on or near the groins appeared well-established and, though they are located within the floodplain and near the active river channel, they seem resistant to moderate flood pressures based on the size of the vegetation.

97-175 Valley Crest Tree Company, Drainage Ditch Improvements, Fillmore

The impact project was widening and excavation of two drainage ditches on the permittee's property to protect agricultural land from flooding. The property was located adjacent to the flood plain on the northern bank of the Santa Clara River in Fillmore. The surrounding habitat is impacted by an invasion of *Arundo donax* as well as run-off from the agricultural fields nearby. The impact resulted in the excavation of two drainages that were approximately 4 m wide and 2-3 meters deep. The drainage ran north to south from the Valley Crest Tree farm property into the floodplain of the Santa Clara River. Required mitigation was removal of *Arundo donax* from the floodplain of the Santa Clara River south of the nursery's production area. The mitigation area was essentially a strip 10-20 meters wide that separated the Tree Company from the Santa Clara River floodplain. Maps in the mitigation plan delineated seven areas where *Arundo donax* was to be removed. Wooden posts painted orange marked the four corners of each of these areas, so boundaries and acreage could be determined. The removal areas were determined not to be waters of the US because they were beyond the ordinary high-water mark of the Santa Clara River, so they were not assessed for wetland function. After further consideration, the functional assessment was completed in case we decide to use those data in the future - despite many of the CRAM metrics being poorly suited to the assessment area. According to an employee of the tree farm who was allegedly responsible for the *Arundo donax*-removal effort a couple of years earlier, *Arundo donax* was removed from the areas and treated with an herbicide to kill the rhizomes of the plants. However, many of the treated mitigation sites showed signs of new *Arundo donax* growth after treatment.

97-203 Tujunga Housing Development

The impact project consisted of a moderately large housing development in a steep foothill slope above Sunland and below the steep headwaters of a sub-catchment. A high-gradient ephemeral drainage was filled by the development and two detention basins were created, one at the top of the development and one at the bottom. The top detention basin (site 1) was below the ~100m open space but was sandwiched between houses and streets and was fenced off from the open space. The mitigation involved planting native vegetation on the banks including some mulefat. The lower site was below the development and caught the extra runoff that would occur from the development. A very steep, terraced planting area occurred above the basin, but water came to it from an extensive series of concrete V ditches on the bank and the underground pipe that ran under the development from the upstream basin. Plantings were on the banks again, but the lower sites had better buffer as it was bordered on one side by an undeveloped chaparral slope. Again, some mulefat was planted, but plantings consisted mostly of upland scrub species.

98-015 Arroyo Conejo Canyon Sewer Replacement, Thousand Oaks

Project involved replacing a failing raw sewage pipe buried under the stream and adjacent terraces. This is a very long site covering much diverse habitat. When in the stream channel the pipe is encased in reinforced rough-poured concrete. The long history of this pipe in the canyon has had significant impact on this otherwise very natural section of stream. The stream reach is all open space and has very high habitat value, but the sewer work, upstream development, and associated flashy floods and poor water quality heavily impair the stream itself. This evaluation was for the replacement work only, not for the larger effect of the sewer line. Mitigation involved re-grading and revegetation in the immediate vicinity of the pipeline replacement where revegetation was possible. There were extensive sections of the stream where the work done and the new concrete poured (which exceeded the extent of the old concrete) resulted in the temporary and permanent impacts that went unmitigated because there was no soil in which to plant anything. Eight specific mitigation sites were delineated and planted. These fell into three general categories: streamside terrace sites, stream wash sites and an armored (with armor flex blocking) bank with dense willow cuttings coming up through the block spaces. We evaluated these three mitigation types separately. Mitigation planting site 7 was on a high terrace and was not significantly in the flood plain. Mitigation planting site 6 was in a side channel wash of the stream. None of the vegetation plantings survived there because of the excessive flow velocity there due to new concrete poured. Site 1 was planted, but the stream wash overwhelmed the plantings in most of the area depositing a high volume of cobble. Mitigation planting site 2 included some bank-armoring work and willow plantings through the armoring which now comprise dense willow cover that is, however, limited by the size of block openings. Other terraces are similar with good replacement of habitat lost by pipe replacement.

98-018 John Laing Homes, Stevenson Ranch Phase IV, Santa Clarita

The impact project was construction of a large housing development. The impact area consisted of chaparral hillsides and a riparian drainage that ran along the valley floor. As part of the impact project, the ephemeral drainage was encased within a pipeline and placed under a new road. The pipeline was then directed into the mitigation area where it supplied water to the restoration. Required mitigation was enhancement of a riparian area that appears to drain runoff from the housing development. Upon closer examination, a culvert connecting to a stream farther up Pico Canyon Rd fed the lower section of the mitigation area. The stream is contained within a pipe under the upper section of the mitigation area and, therefore, isolates the upstream section from a wetland water source. The lower section, in contrast, is adequately fed by the outflow from the stream culvert and results in an appropriate wetland/vegetated streambed hydrology for the lower section. The entire back boundary of the mitigation site is delineated by a V-culvert, which would presumably catch any overland watershed flow down from the adjacent hill and channel it (via the V-channel) to the lower mitigation area. This further prevents adequate hydrology in the upper section of the mitigation area. Since CRAM is based on presence/absence, the hydrologic isolation of the upper site is not readily expressed in CRAM scores for this site since the lower section of the site warranted strong scores for presence of proper hydrology. Mitigation was almost complete when we visited the site as determined by observations that most of the plants were planted and irrigation lines were laid almost completely throughout the site. Some replacement plants were also being planted when we visited. Irrigation lines that delineated planting areas determined boundaries of the mitigation site.

98-032 Rancho del Tio Housing Development, Beardsley Wash, Camarillo

The impact project was construction of a large housing development and a golf course. The impact project was developed on most likely old farmland used for orchard production. However, a perennial stream (Beardsley Wash) borders the north end of the property and supports wetland and riparian habitats. Impacts to this habitat required mitigation. Mitigation was revegetating a wetland that was disturbed temporarily and restoring part of Beardsley Wash by removing exotics and replanting with native species. Both mitigation sites had clear boundaries and we were able to map them with the GPS. The first mitigation site was a wetland at the edge of which a road for the golf course was built. This site is completely surrounded by manicured golf lawns. The main source of water for the wetland is runoff from the golf course and housing development that runs into Beardsley Wash after leaving the wetland. This mitigation site supports wetland vegetation and may help function in concert with another pocket wetland located immediately upstream in this mitigation site to filter some contaminants out of the runoff passing through the habitat. Water flow is low but perhaps greater vegetation and a larger area are needed to significantly impact the water quality. The second mitigation site was an upland strip of land in a riparian corridor along the road at the northern edge of the housing development where native riparian species were planted. Under normal flow conditions, water from the stream would not reach this second mitigation site due to steep, high banks. Thus, the plantings appear more upland in nature than actual riparian habitat. There may be minimal subsurface flow to this restoration area from the creek, but the plantings seem to be dependent on the irrigation that runs through the area for a consistent water supply.

98-055 Old Topanga Road, Department of Public Works, Los Angeles

The impact project was installation of various erosion-control structures to protect the road from erosion. Required mitigation was payment of in-lieu fees to the USFS for exotic-plant removal anywhere such projects are undertaken. Funds from this file were pooled with funds from seven other projects, including file # 02-018: Verdugo Debris Basin, and paid to the USFS, according to a representative at the Department of Public Works. This file was not assessed in the field for function. Rather, it was evaluated solely on 401 permit compliance and is part of the "fifty-plus" category of our analysis. Recently, in a conversation with a USFS representative, we were told that a draft Blanket Agreement covering mitigation for eight Public Works projects had not been finalized as of September 15, 2004 and the funds had not yet been transferred. We had recorded the funds as being paid based on a conversation this spring with a representative from the Department of Public Works who said they had been paid. At the time, we had not received any indication to the contrary. Instead of investigating this matter further to clarify the compliance status of this file, we highlight this file as having a potential compliance issue that the RWQCB could investigate, if desired.

98-072 Malibu Terrace, Calabasas

The project impacts associated with the Shea Homes development of Chateaux Mont Calabasas include permanent impacts to the wetland, streambed and riparian habitats along a tributary to the Las Virgenes Creek. The total impacted acreage was 0.47 acres. The proposed mitigation to compensate for this loss of habitat entailed restoring and creating a southern riparian scrub habitat onsite that would be connected to a small, existing patch (0.3 acres) of riparian scrub habitat. In addition, livestock grazing was to be stopped on the property. Lastly, 399 acres were preserved as open space – though land preserves are not evaluated as mitigation in this study. The mitigation site is located southwest of the development in the adjacent canyon. About a half-mile up the canyon, there is an existing riparian and streambed habitat with mature willows, oaks and cottonwoods. It is assumed that this section is the existing 0.3 acres of riparian scrub. The mitigation site is below this area. Restorative planting is only evident in the upper third or quarter of this site, although the canyon continues down to Las Virgenes Rd. and culminates in a detention basin. Since only a section of the proposed mitigation site shows evidence of mitigation work (e.g. restorative planting and less cover by exotics), only the upper portion was mapped with GPS totaling approximately 0.34 acres. Below this area, exotic plants dominate the canyon streambed and concrete freeway borders (10' x 3') were placed across the stream at intervals of about 100 yards in an apparent attempt to add hydrological complexity to the streambed. In order to meet permit requirements of 1.0 acre of mitigation, this entire lower canyon streambed needed to be included in the mitigation area. However, since no native plantings could be found, exotics plants dominated the landscape, and concrete freeway borders were the only evidence of human interaction with the site, the lower canyon was not assessed as completed mitigation. The upper site was assessed and received poor scores due to low native plant density, low survivorship of plantings, inadequate hydrology to support native plants, and severe impact of invasive species with little to no evidence of non-native removal efforts. The poor quality and size of this mitigation area were surprising since the housing development associated with the impact contains healthy and robust native plantings on all graded hillsides, slopes and detention basins within the property boundary. After such successful revegetation of natives within the development, one would expect an equally impressive mitigation site. However, based on the poor mitigation site, this was not the case.

98-112 Lake Eleanor Hills Residential Development, Westlake Village

Impacts were a small acreage of permanent impacts to streambed and riparian areas. The surrounding area is high elevation in the coastal mountains with ephemeral streams and coastal scrub habitat. This housing development delineated 3 sites as mitigation: 1) detention basin slopes and bottom; 2) an area south of an existing wetland; and 3) a riparian corridor. Most planting done within the boundary of the housing development were native, even outside the mitigation areas. And several large trees (mainly oaks) onsite were preserved instead of being impacted. However, there are some important issues with the mitigation sites chosen. Site 1 had excessively high banks and a severe flood event could rip away much of the plantings. Site 1 is small, offering little habitat to wildlife, and sandwiched between two homes. Site 2 is adjacent to a nice existing wetland; however, their mitigation consisted of revegetating the slopes present around the wetland that were artificially created to level the adjacent area for home pads. They could have expanded the wetland basin, but, rather, they just revegetated the slopes. Therefore, this mitigation seems more like erosion control for grading that was necessary to create housing pads. Presumably, both site 1 and site 2 were not completed in terms of revegetation because several plant containers were onsite at both sites 1 and 2, but not yet in the ground. Site 3 was complete and akin to upland with artificial irrigation supplying plantings with needed water. A nature trail ran through the site, but the corridor was surrounded by concrete road on either side and had no natural water source. Across the road is the wetland, but connection is minimal to nonexistent because of the road.

98-196 Parking and Road Extension for Recreation Area, Point Mugu Naval Base

The impact project for file 98-196 was construction of parking facilities and a road extension for existing facilities. The impacts associated with this development included filling and developing over existing salt marsh habitat found on the Point Mugu Naval Base. The required mitigation for file 98-196 was restoration of salt-marsh habitat offsite at the Laguna Road Wetland Restoration and Enhancement Site also on the naval base. This restoration site is also part of a research study on salt-marsh restoration in cooperation with the USFWS and the ACOE. Normal tidal flows were re-established to create appropriate hydrologic conditions for the native salt marsh vegetation that was planted and has become well-established. The area is subject to natural tidal cycles that flood the majority of the site at high tide. Wildlife use is high with crabs and C*erithidea* snails being very abundant. Endangered terns are also present. They nest on two barren island located within the mitigation site. These islands are periodically treated with Rodeo herbicide to prevent vegetation growth on the islands. The endangered terns only nest successfully in barren, non-vegetated habitats. There is a small presence of invasive ice plant that is common in adjacent, non-impacted sections of the Pt. Mugu Naval Base.

99-006 Sinaloa Lake Phase II, Simi Valley

The impact project was restoration of a recreational and aesthetic lake by excavating and reconstructing the existing dam, clearing and reshaping the bottom of the lake, filling the lake with water, and establishing riparian habitat around the edges. The impact area was located within a residential neighborhood. The Sinaloa Lake was previously located onsite of the project impacts. Previously, the dam was breached and the lake drained. This project reconstructed the dam and refilled the lake. Since the lake was re-created in the same site as it was previously located, minimal habitat and function were lost through the impacts of this project. Rather, the required mitigation resulted in the creation of 17 acres riparian, wetland, and lake habitat onsite. The boundaries of the mitigation site were delineated clearly by a trail around the lake. Islands were created in some of the fingers of the lake to provide additional space for riparian and wetland vegetation as well as protected wildlife habitat. Vegetation was removed from the side of the earthen dam bordering the lake, per ACOE mandate, allegedly to maintain its structural integrity. Therefore, vegetation on the bank bordering the dam is more narrow and sparse than the other banks. The entire lake is well used by wildlife, though not all of them are native. Carp are dominant in the lake waters and attempts have been unsuccessful to catch them for removal. A community-based team of volunteers periodically monitors and maintains the vegetation and islands along with replanting natives and removing exotic species.

99-026 Avenue Scott Bridge, Valencia Company, San Francisquito Creek, Santa Clarita

The mitigation for this file consisted of 3 sites. The first was located onsite along the banks of the Scott Ave Bridge in San Francisquito Creek. This part of the creek wash is an ephemeral, sand-dominated floodplain with mostly annual, less-than-a-year-old vegetation with low overall quality habitat value. Some habitat functions were lost by the aerial coverage of the bridge and concrete lining, but other functions were minimally lost by the pier footings and concrete lining of the banks. Mitigation consisted of revegetation plantings and exotic removal downstream of the site. It is impossible to determine the boundaries of the mitigation sties and to distinguish them from un-enhanced streambed sections upstream or downstream. Here, replacement plantings were planted downstream of the bridge. Cover and density were appropriate; however, the riprap was not revegetated as the permit stated. This would have been impossible since there was no space among the riprap for planting. The second mitigation site was upstream of the Newhall Ranch Rd. Bridge. The southwestern bank already contained a mitigation area that was further extended as mitigation for this project. The topography was appropriate to allow overflow into the riparian area and floodplain and the plantings were healthy, though not dense. There was a good variety of plants and the presence of a non-native buffer and bike trail on the outer portion of the channel. The third site was near the confluence of the Santa Clara River and San Francisquito Creek. Exotic species removal, primarily *Arundo donax*, was supposed to occur here. The exact location could not be positively determined and *Arundo donax* was found in moderate presence in this area. The benefit of the doubt was applied in this case to the permittee that *Arundo donax* removal did, indeed, occur. Since *Arundo donax* is a very noxious and difficult-to-remove weed, it is possible the eradication efforts took place and were simply unsuccessful to completely remove the species from the mitigation area.

99-037 Casitas Dam Retrofit, Lake Casitas, Ojai

The impact project consisted of installing a large support below the Casitas Lake Dam that increased the overall width and volume of the dam. There was a moderate amount of wetland and riparian area and Waters of the United States that were filled by this structure. Also, temporary and permanent impacts to nearby drainages occurred due to access road improvements, which were in mostly dry, unvegetated streambed habitats. The mitigation consisted of enhancing an already protected riparian area above the lake at the base of a small drainage that feeds the lake. A small riparian strip and an open area that had been a reservoir were part of this mitigation site. The reservoir berm had been breached ~15 years prior to this project. Some wetland conditions existed prior to this project due to the partial impoundment, though invasive species, such as Eucalyptus, were common in the area. Mitigation involved removing the eucalyptus and planting riparian/scrub vegetation in the riparian area. In the "wetland" area, it involved construction of a meandering base-flow channel though the area and planting wetland/riparian species along that channel and throughout the old impoundment. The site was still somewhat young and was still being irrigated. Survivorship was good, but much of the typha seemed to be stressed and other species showed mortality as well. No surface water was present in either the riparian enhancement area or the wetland. Several Eucalyptus recruits were present in the riparian enhancement area. Overall, the site as a decent wetland/riparian area, but the water seemed to be on the scarce side. The mitigation work was good, but not an overwhelming improvement over what was already present at this protected site.

99-045 Arroyo Simi Channel Replacement, Simi Valley

The impact project site was a concrete channel with some cracks and plants growing up though the cracks. Thus, the quality of the habitat lost was very low. The mitigation consisted of *Arundo donax* removal and castor bean removal from an unspecified amount of the stream reach downstream, which did not significantly change the function already present at that location. No *Arundo* and moderate castor bean and tree tobacco occurred at the mitigation site. There is no real evidence that mitigation was done and the boundaries of the site could not be determined, but it is assumed that they did the work. Regardless, a new impact has occurred at the mitigation site. The entire reach of the mitigation site has been reconstructed by a new housing development that occurs on both sides of the reach (but mainly on the right bank and farther upstream on the left bank.) As part of this new development, both banks of the mitigation site have been completely armored with interlocking blocks, and a two-lane bridge crosses through the middle of the site. Riparian vegetation has been planted in the block spaces (mulefat, willow), but it is very young. The stream bottom is mostly muddy with dense typha and other vegetation. It is wet across the entire length to the bottom of the banks. The project site entailed replacing a shallow, trapezoidal channel with a tall box channel.

99-054 Golden Valley Road Extension, Santa Clarita

The mitigation for the Golden Valley Road Extension consists of enhancing riparian streambed channels parallel to the previously existing channels. The impact area was poor quality habitat with little vegetation cover. Mainly scrub habitat with few limited ephemeral drainages where some wetland and riparian species could exist. Water flow was minimal and the area was impacted by the presence of oil drilling and excavation activities that occurred on the adjacent hilltops. The entire area is a site of new development with much of the hills being graded for future construction and the creation of new roads. The mitigated areas consist of narrow streambeds running parallel to the new Golden Valley Road and draining into a large detention basin. Only the walls of the detention basin were vegetated, and therefore only the walls were mapped with GPS and counted in our assessment area. The stream is a very small ephemeral streambed. Uphill activity from the stream includes oil drilling/excavation that may impact water quality or increase the sediment load in the stream. Soils were primarily sandy (i.e. badlands) with erosion a potential future problem. Some erosion control netting was placed in the streambed channel to control this effect and was proving moderately successful. The location of the mitigation site immediately adjacent to the Golden Valley Road resulted in a high presence of trash in the mitigation site and little buffer surrounding the area. It is a poorly situated site to support wildlife or well-established plants due to the impact of close road traffic and the limited water supply, respectively.

99-055 Hill Canyon Treatment Plant, North Fork Arroyo Conejo, Thousand Oaks

The impact project involved widening and armoring with riprap the north fork of Arroyo Conejo (Conejo Creek) as it runs along the Hill Canyon Treatment Plant. This section of stream was already heavily impacted by previous work and was in a degraded condition prior to this project. The slopes were largely unvegetated with mostly invasive grass and weed cover. The lower sections had some riparian vegetation cover. The new channel is wide and steeper with ~8m wide riprap along both banks. The right bank is higher with 2-20 m slope between the top of the riprap and the access road. Mitigation plantings occur in this area, but, presently, there is sparse vegetation and mostly bare ground. The left bank has a narrow 1-3 m wide planting area between the riprap and the property fence line, and is presently sparse but with some hydro seeded vegetation. A small area on the left bank extends down to the waters edge below where the riprap ends. Mitigation in these areas was supposed to be for wetland plants in the stream, but instead, riparian plantings were done here up high on the bank slopes. This was considered our mitigation site 2. The main mitigation for this project was a portion of a newly created wetland down-slope of the HCTP between the confluences of the Arroyo Conejo and the N. Fork. Two irregularly shaped basins were created with flow-through water from the treatment plant. These are very nice wetland creation sites that have made lots of habitat for birds and other wildlife. They are not treatment wetlands per se because they only intake a small portion of the flow from the plant. While the construction of these wetlands was well thought out, their main function is providing habitat as they are cut-off from the local stream flow and local hydrology. They have no flood control function, for example. This site is much larger than the required acreage for this project and is meant to be a mitigation bank site for future city of Thousand Oaks Projects. It is our site 1.

99-071 Industrial Park, Thousand Oaks

The impact project was construction of a large industrial park. Required mitigation was payment of in-lieu fees to the Calleguas Creek Watershed Habitat Restoration Account managed by the Coastal Conservancy. According to Peter Brand of the Coastal Conservancy who manages that account, the funds have been paid but not used for mitigation yet. This file was not assessed in the field for function. Rather, it was evaluated solely on 401 permit compliance and is part of the "fifty-plus" category of our analysis.

99-100 Telegraph Road Drain, Bosque del Rio Hondo

The impact project site was not visited, but was apparently a small drainage ditch with a soft bottom that was about 7ft wide and about 500ft long. Our inference was that it was similar to other drainage ditches with soft bottoms that have considerable wetness and some vegetation, but are of low quality overall. We are only considering this addendum to an earlier permit, not the original project. Mitigation was simply $400.00 for 0.02 wetland acres paid to the Mountains Conservation Authority. No deposit of $400 was apparent to them, but it was likely included with a larger check. We made the assumption that the money was paid. The money (the original project and the $400.00) was used at a mitigation site in the Bosque Del Rio Hondo Nature Area in the Whittier Narrows. This site was an old oil field with highly compacted soil and much old asphalt. The site is within the general flood zone of the Whittier Narrows Dam, but the floodwaters never reach as far as the mitigation site due to higher topography. There is no direct hydrological connection to waters of the US, though the site may have access to some subsurface water as the area floods. Much mulefat has been planted with some young sycamore trees and several walnut and a few oaks. Most of the area was covered with Chrysanthemum, hemlock, and mustard.

00-112 Route 30, San Antonio Creek, Claremont

The impacts for this project were extremely minimal. Only 0.009 permanent acres and 0.09 temporary acres of concrete lined streambed were impacted to create a box culvert under a Route 30 stream crossing. The impact area was not a natural site prior to impacts since the channel was already concrete-lined. Therefore, minimal vegetation and wildlife utilization could be present, and flood storage and dissipation services would have been poor.

Mitigation occurred within the Cajon Creek Conservation Bank that encompasses 1.378 acres. Mitigation for this project corresponded to some portion of a 6.93-acre parcel purchased as mitigation for construction of related projects to the Route 30 Improvement Project. This file is one component of the improvement and the specific acreage for mitigation or its location within the Conservation Bank cannot be positively determined. Rather, the entire mitigation bank was evaluated for permit compliance and function.

The area was an ephemeral wash with very sandy, unconsolidated soils. The wash was dry at the time of assessment. The entire conservation area was preserved and signs were posted to keep trespassers off the conservation property. No wetland habitat was present; the area consisted only of dry vegetated and unvegetated streambed and the associated riparian and upland habitats. Common plant species include Coyote Bush, Oak, Mulefat, Yucca, Sage, and *Opuntia*. Percent cover among trees was minimal. Shrubs had the highest percent cover and there were little to no herbs present due to the dry condition of the site. Debris, especially woody debris, was limited. Most debris was coarse and not well-decomposed.

The mitigation site was part of the area's watershed. The conservation bank was located directly in the dry wash that drained the San Bernadino Mountains. The area was low-slope and had very transitional topographical features that were continually eroding and reforming.

00-127 Auto Hobby Shop, Point Mugu Naval Base

The impact project for file 00-127 was construction of an auto hobby shop. The impacts associated with this development included filling and developing over existing salt marsh habitat found on the Point Mugu Naval Base. The impact project for file 98-196 was construction of parking facilities and a road extension for existing facilities. Required mitigation for file 98-196 was restoration of salt-marsh habitat offsite at the Laguna Road Wetland Restoration and Enhancement Site also on the naval base. Required mitigation for files 00-127 and 02-109 was the use of mitigation credits from this restoration site. This restoration site is also part of a research study on salt-marsh restoration in cooperation with the USFWS and the ACOE (Principal Investigators are R. Ambrose and R. Vance at UCLA). Normal tidal flows were re-established to create appropriate hydrologic conditions for the native salt marsh vegetation that was planted and has become well-established. The area is subject to natural tidal cycles that flood the majority of the site at high tide. Wildlife use is high with crabs and *Cerithidea* snails in abundance. Endangered terns are also present. They nest on two barren island located within the mitigation site. These islands are periodically treated with Rodeo herbicide to prevent vegetation growth on the islands because the endangered terns only nest successfully in barren, non-vegetated habitats. There is a small presence of invasive ice plant that is common in adjacent, non-impacted sections of the Pt. Mugu Naval Base.

00-160 Greystone Homes, Hasley Canyon, Val Verde

The impact project was construction of a large housing development. The housing complex was situated up the base of a foothill in the Val Verde area. The impact area consists of very dry hillside chaparral habitat primarily covered in grasses and small shrubs. An ephemeral drainage was located on the mitigation sites and the associated riparian and wetland habitats were impacted by the housing development. Required mitigation was creation of a riparian area and enhancement of a streambed by removing debris and exotic/invasive species. The mitigation site was located below the housing development across Hasley Canyon Rd. in the lowest point in the Canyon. The site already hosted an existing wash with limited riparian species present. The mitigation consisted of creating a culvert the would channel runoff water from the housing development under Hasley Canyon Rd and release it into the mitigation site, thereby creating a more consisted water supply to support wetland vegetation. This did increase water flow to the site, but the upper elevation areas of the mitigation site were still water-stressed. The division between the riparian area and streambed was unclear, so we mapped the areas as one site. The overall extent of the mitigation area was delineated clearly, so we could determine its boundaries. The mitigation appeared to have been done within the last year and most plantings were not well-established. Erosion was prevalent within the channel due to the sandy nature of the soil within the site in conjunction with the artificial water supply. However, the natural areas located in the Hasley Canyon area appeared very similar to the mitigation site exhibiting erosion scarring, water-stressed plants and minimal obligate wetland and riparian species.

00-166 Grimes Canyon Creek, City of Moorpark

The impact project consisted of armoring the banks of the Grimes Canyon wash around two outfall structures associated with an extensive aquifer storage system. One of these riprap structures was installed without proper permits and this mitigation was to compensate for those losses as well as a new outfall structure's riprap armoring. The stream reach in the vicinity of these two impacts is a deeply cut ephemeral wash with dense eucalyptus trees as the dominant canopy. The banks that were armored with riprap would have already been in a moderately degraded state. The mitigation consisted of two disturbed projects. The main project involved restoration planting downstream of the impact sites on the east side of Grimes Canyon Rd. in the vicinity of Maria Dr. At this site, a large planting area was established on the left bank and terrace and a smaller planting area on the right bank and terrace. The channel at this location has a dry unvegetated 100% sand wash. The right bank plantings ran down the bank to the wash margin and represented normal riparian hydrology for the area, though it was narrowly sandwiched between the road and the wash and some bank erosion had occurred. The other site was partially connected to the stream but was mostly behind a higher berm so that floodwaters would likely not flow over the banks into the mitigation site. We judged that this site was partially riparian due to some over bank flow potential. Both sides have successful plantings with good diversity, though most species were upland with only a moderate cover of mulefat.

The other site was adjacent to the second impact site/riprap outflow. A very small (few meters squared) area to the side and above the riprap was planted with native upland species. This site was disconnected hydrologically from the dry wash was under the eucalyptus canopy and had low survival.

00-168 (99-170 is the old permit number) Shea Homes, Camarillo

The impact project was construction of a large housing development. The housing development is located in Camarillo on the site of an old farm's citrus orchards. The northwestern edge of the construction site is still bordered by orchards while the remainder of the housing development is next to new residential homes. Impacts to a perennial drainage (most likely perennial due to agricultural runoff) resulted in the need for mitigation. Required mitigation was creation of a riparian/ vegetated streambed drainage area--essentially a large detention basin--within the development. Impact construction was ongoing when we visited the site, but the mitigation area had been graded and planted. The mitigation site appeared to be recently completed and was in approximately its first year of monitoring. The main artificial water source appears to be urban runoff from the housing development. Water was present, although at low flow during the time of our visit. In addition, the plants both on the banks of the detention basin and in the riparian/vegetated streambed bottom were artificial watered by an irrigation system. The banks of the riparian area were stabilized with netting, hydro seeded, and planted with both native and non-native trees. These banks are extremely tall and stretch about 60m upwards at about a 45 degree angle to housing pads above the detention basin bottom. Therefore, the mitigation site is contained within this vegetated bank buffer region that has been planted with natives. Native riparian and wetland species were planted in the streambed. Plants appeared healthy, had adequate water and were propagating naturally.

01-017 Fish Creek Restoration, Azusa, Los Angeles

The impact project consisted of repositioning the lower Fish Creek stream channel within the property of the Fish Creek Quarry. This section of creek had been heavily affected by the quarry activities and had been previously moved from its original location to a new position as the base of the western cliff. In this location, the creek received heavy inputs of sediment and gravel eroding from the cliff face. This permit was for moving the stream back to its original location and was evaluated in the context (i.e. impact site was the existing stream course, not the original location). The newly constructed channel has a moderate meander, the channel dimensions were appropriate, cobble, boulder and gravel were placed in the bottom of the stream, and the stream mitigation was superb overall. Vegetation was a bit low in diversity but it is expected to develop into a fully functioning stream. Buffer and compaction issues are the only substantial shortcomings of the site.

01-020 Stonecrest Replacement Sewer Pipeline Project, Santa Clarita

The impact project was replacement of sewer pipelines. The pipeline was located in a moderately impacted area of the Santa Clara River. Excavation/mining activities occur nearby and the River wash is primarily dominated by cobble and bolder with very limited vegetation. The river wash was dry at the time of assessment. The required mitigation was onsite restoration of the impact area all of which was within the channel of the Santa Clara River. An additional requirement was to mulch any native vegetation removed during construction and use it to cover the impact area. Though largely indistinguishable from the surrounding areas upstream and downstream from the construction, the impact area was identifiable by a shallow trench and grading of the banks. Due to the poor quality of habitat in the Santa Clara River surrounding the impact site, very few services were lost by this project. Restoration restored the area to a condition very closely resembling the adjacent wash and revegetation of the impact area was not required due to the little vegetation present naturally in this section of the Santa Clara River.

01-135 Encasement of Ojai Valley Main, San Antonio Creek, Ojai

The impact project involved repairing a portion of a concrete-encased pipe crossing that exists in a ~15 m wide ephemeral wash in the Ojai area. The site was located ~5m downstream of the Route 150 Bridge crossing on San Antonio Creek. About ½ of the exposed concrete encasement was replaced. The other half was untouched. The new concrete and some associated grouted riprap armoring of the new concrete represented a small amount of additional permanent impacts. Some temporary impacts occurred as well. The mitigation was revegetation plantings in the area between the replacement work and the 150 bridge. Only a small amount of mulefat was present in this area, though mulefat was present between the untouched portion of the crossing and the bridge. In addition, a large 3m x 3m slab of concrete, which was part of the bridge abutment, had fallen into this area. Much of the stream energy seems focused on this left bank. The project called for integrated- concrete flow-dissipation structures on the new concrete section. Instead, several small, rounded boulders were placed in the wet concrete as a somewhat less effective substitute.

02-018 Verdugo Debris Basin, Department of Public Works, Los Angeles

The impact project was construction of a new retaining wall in a debris basin to protect one of the slopes in the basin from erosion. Required mitigation was payment of in-lieu fees to the USFS for exotic-plant removal anywhere such projects are undertaken in the Angeles National Forest. Funds from this file were pooled with funds from seven other projects, including file 98-055: Old Topanga Road, and paid to the USFS. This file was not assessed in the field for function. Rather, it was evaluated solely on 401 permit compliance and is part of the "fifty-plus" category of our analysis. Recently, in a conversation with a USFS representative, we were told that the draft Blanket Agreement covering mitigation for eight Public Works projects had not been finalized as of September 15, 2004 and the funds had not been transferred yet. We had recorded the funds as being paid based on a conversation this spring with a representative from the Department of Public Works who said they had been paid. At the time, we had not received any indication to the contrary. Instead of investigating this matter further to clarify the compliance status of this file, we highlight this file as having a potential compliance issue that the RWQCB could investigate, if desired.

Furthermore, we have noticed inconsistencies in the mitigation requirements listed in the 401 permit for this file that might relate to the draft Blanket Agreement. In Attachment A, "Proposed Compensatory Mitigation" is providing funds to the USFS for the removal of 1.571 acres of non-native vegetation. In Attachment B, item 7 calls for restoration of 0.22 acres to offset temporary impacts to 0.11 acres. Also in Attachment A, item 8 calls for compensatory mitigation for impacts, both temporary (0.11 acres at a 2:1 ratio=0.22 acres) and permanent (0.06 acres at a 5:1 ratio=0.52 acres), stating that these requirements may be satisfied through payment of in-lieu fees for the creation or restoration of 0.52 acres (temporary + permanent mitigation requirements). These mitigation requirements (1.571 acres in Attachment A and 0.52 acres in Attachment B) appear to contradict one another. It is notable that, in the draft Blanket Agreement, the mitigation required for all eight files covered by the agreement is 1.571 acres. Also, in this draft Blanket Agreement, we note that the acreage of mitigation required for this file is 0.30 acres which is the acreage listed in the 401 permit's Attachment B as mitigation required for permanent impacts. Mention is not made of the 0.22 acres of mitigation for temporary impacts listed in item 7 of Attachment B of the 401 permit. We used the 1.571 acres in our calculations of mitigation requirements throughout the report, but we highlight this file and the related Blanket Agreement as having apparent inconsistencies so that they can be investigated, if desired.

02-108 Forecast Homes, Mint Canyon, Santa Clarita

The impact project was construction of a large housing development. Required mitigation was payment of in-lieu fees to the USFS for the removal of *Arundo donax* in San Francisquito Canyon. The USFS and the permittee's agent confirmed payment and the removal is underway at several sites in the canyon. We visited some of the sites, but did not evaluate function at them because multiple sites throughout the canyon were involved in the removal project. *Arundo donax* was being removed by two methods due to the presence of endangered species in the stream (three-spine stickleback and red-legged frog). In the stream and within 25' thereof, it was being removed manually, then treated with an herbicide (Aquamaster) to kill the rhizomes. Outside of 25' from the stream, it was being treated through foliar spraying of an herbicide. This file was not assessed in the field for function. Rather, it was evaluated solely on 401 permit compliance and is part of the "fifty-plus" category of our analysis.

02-109 Aircraft Parking Apron, Point Mugu

The impact project for file 02-109 was the construction of an aircraft parking apron. The impacts associated with this development included filling and developing over existing salt marsh habitat found on the Point Mugu Naval Base. Mitigation occurred within the same mitigation bank created for file 98-195. This restoration site is also part of a research study on salt-marsh restoration in cooperation with the USFWS and the ACOE. Normal tidal flows were re-established to create appropriate hydrologic conditions for the native salt marsh vegetation that was planted and has become well established. The area is subject to natural tidal cycles that flood the majority of the site at high tide. Wildlife use is high with crabs and *Cerithidea* snails in abundance. Endangered terns are also present. They nest on two barren island located within the mitigation site. These islands are periodically treated with Rodeo herbicide to prevent vegetation growth on the islands because the endangered terns only nest successfully in barren, non-vegetated habitats. There is a small presence of invasive ice plant that is common in adjacent, non-impacted sections of the Pt. Mugu Naval Base.

10.6. Appendix 6: GPS Information

The following six tables contain the GPS information for mitigation sites visited and assessed. The base stations used to differentially correct the data in Pathfinder Office are given in Table 37. The GPS coordinates of all features (many mitigation sites have multiple features) are given in Table 38. The acreage of each GPS feature collected (including the four features that were created in ArcView; see Table 41 for a description of these features) is displayed in Table 39. A description of calculations necessary to determine the acreage of mitigation sites with multiple features associated with them is included in Table 40. An accounting of all the information and decisions involved in the determination of proportional acreage estimates that each of the 79 mitigation sites represented is provided in Table 42. These acreage proportions were necessary for the calculation of single compliance and success scores per permit file. Individual mitigation site compliance and success scores were multiplied by these proportional acreage estimates, and the resulting data were summed by file to obtain these single scores.

Table 37. Base stations used for differential correction of data in GPS Pathfinder Office.

File #	Base Station
91-02	SOPAC, Cal State Channel Islands, daily
92-04	SOPAC, Circle X Ranch, daily
92-11	SOPAC, Calabasas High School, daily
93-06	SOPAC, Allen Osborne, daily
93-09	SOPAC, Caltech, daily
93-15	SOPAC, Carbon Creek Control Structure, daily
93-19	SOPAC, Westchester High School, daily
94-08	SOPAC, Garvey Reservoir, daily
94-09	SOPAC, Fillmore Teleport, daily
95-003	SOPAC, Claremont, daily
95-02	SOPAC, Allen Osbourne, daily
95-04	SOPAC, Fire Camp 9, daily
95-045	SOPAC, L.A. Pierce College, daily
95-062	SOPAC, Casitas Station, daily
95-07	SOPAC, Covina H.S., daily
95-08	SOPAC, Cal State Channel Islands, daily
95-091	SOPAC, Circle X Ranch, daily
95-119	SOPAC, Allen Osbourne, daily
96-086	SOPAC, Castaic Dam, daily
96-102/00-127/98-196	SOPAC, Cal State Channel Islands, daily
97-080	SOPAC, CSU Northridge, daily
97-088	SOPAC, Fillmore Teleport, daily
97-129	SOPAC, Covina H.S., daily
97-133/97-103	SOPAC, Fillmore VORTAC, daily
97-170	SOPAC, Castaic Dam, daily
97-175	SOPAC, Fillmore Teleport, daily
97-185	SOPAC, Allen Osbourne, daily
97-203	SOPAC, Brand Basin, daily
98-015	SOPAC, Allen Osbourne, daily
98-018	SOPAC, CSU Northridge, daily
98-032	SOPAC, Cal State Channel Islands, daily
98-072	SOPAC, Calabasas High School, daily
98-112	SOPAC, Allen Osbourne, daily
98-112 additional	SOPAC, Allen Osbourne, daily
99-006	SOPAC, Allen Osbourne, daily
99-026	SOPAC, Castaic Dam, daily
99-037	SOPAC, Casitas Station, daily
99-054	SOPAC, Fire Camp 9, daily
99-055	SOPAC, Circle X Ranch, daily
99-100	SOPAC, Garvey Reservoir, daily
00-112	SOPAC, Cal State Channel Islands, daily
00-160	SOPAC, Castaic Dam, daily
00-166	SOPAC, Fillmore VORTAC, daily
00-168	SOPAC, Cal State Channel Islands, daily
01-017	SOPAC, Covina H.S., daily
01-020	SOPAC, Fire Camp 9, daily
01-135	SOPAC, Happy Valley School, daily
02-108	SOPAC, Castaic Dam, daily

Table 38. GPS coordinates of all mitigation features evaluated in Phase II. We recorded several features for some permit files because they consisted of multiple discrete mitigation project types.. The "single points" represent sites where we could not determine the boundaries of the mitigation sites. For all other sites, these GPS coordinates were extracted from the computer files from a central location within the area polygons.

File #	Site #	Description	Longitude (N)	Latitude (W)
91-02	1	single point	34°13'43"	118°58'20"
92-04	1	upstream	34°10'02"	118°57'42"
	1	downstream	34°10'02"	118°57'41"
92-10	1	single point (coordinates estimated from map)	34°16'49"	118°48'52"
92-11	1	single point	34°02'05"	118°40'59"
93-06	1	north	34°09'60"	118°45'44"
	1	center	34°09'49"	118°45'43"
	1	south	34°09'32"	118°45'45"
93-09	1	west bank	34°08'25"	118°10'06"
	1	east bank	34°08'27"	118°09'59"
	2	west	34°08'27"	118°10'05"
	2	east	34°08'28"	118°10'03"
93-15	1	zone C wetland	33°58'11"	117°53'34"
	2	zone A/7	33°58'12"	117°52'56"
	3	zone A (preserve)	33°58'11"	117°53'06"
	4	zone A (enhancement)		
93-19	1	freshwater marsh	33°58'11"	118°25'52"
94-03	1	upstream (coordinates estimated from map)	34°16'40"	118°47'54"
	1	downstream (coordinates estimated from map)	34°16'55"	118°49'03"
94-08	1	single point	34°02'22"	118°01'36"
	2	single point	34°01'47"	118°04'14"
94-09	1	single point	34°23'47"	118°58'14"
95-02	1	oak woodland	34°10'28"	118°45'50"
	2	single area	34°11'23"	118°45'06"
95-003	1	1a-riparian/veg stream	34°01'18"	117°46'33"
	1	1b	34°01'19"	117°46'37"
	1	1c	34°01'19"	117°46'39"
	1	1d	34°01'19"	117°46'30"
95-04	1	north of route 14	34°26'01"	118°23'33"
	1	south of route 14	34°25'60"	118°23'32"
	1	additional removal	34°25'60"	118°23'32"
95-07	1	single point	34°03'41"	118°00'07"
95-08	1	a (downstream)	34°10'18"	118°58'11"
	1	b (upstream)	34°10'20"	118°58'19"
	2	riparian	34°10'12"	118°58'18"
	3	riparian canyon	34°10'05"	118°58'24"
	4	riparian canyon	34°10'09"	118°58'06"
95-062	1	line along route 150	34°23'33"	119°25'37"
	1	single point	34°23'32"	119°25'40"
	1	single point	34°23'32"	119°25'36"
	1	single point	34°23'33"	119°25'35"
	1	single point	34°23'32"	119°25'34"
	1	single point	34°23'33"	119°25'33"

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File #	Site #	Description	Longitude (N)	Latitude (W)
95-091	1	1-wetland	34°11’06”	118°55’42”
	2	2-upland	34°11’05”	118°55’42”
	2	3-upland	34°11’03”	118°55’38”
	2	“4-upland”	34°11’01”	118°55’31”
	2	upland	34°11’02”	118°55’32”
95-119	1	detention basin 1	34°15’45”	118°43’50”
	2	detention basin	34°15’34”	118°44’06”
	3	willow in arroyo simi	34°15’45”	118°43’55”
96-086	1	restorative planting	34°25’18”	118°32’01”
	2	outfall (single point)	34°25’25”	118°32’27”
	3	arundo removal	34°25’25”	118°32’30”
	4	piers (single point)	34°25’08”	118°32’56”
96-102	1	salt marsh	34°06’27”	119°07’19”
97-080	1	single area	34°17’04”	118°40’14”
97-088	1	single area	34°23’49”	118°59’52”
	2	single area	34°23’53”	118°59’55”
97-129	1	basin A north	34°07’52”	117°57’58”
	1	basin A south	34°07’44”	117°57’47”
	1	basin B north	34°07’53”	117°57’52”
	1	basin B south	34°07’46”	117°57’52”
	3	site 3 W basin supply line	34°07’46”	117°57’48”
97-103/97-133	1	single point	34°18’31”	118°56’30”
	2	single point	34°17’38”	118°55’26”
97-170	1	single point	34°24’42”	118°39’32”
97-175	1	A	34°22’28”	118°58’45”
	1	B	34°22’30”	118°58’37”
	1	C	34°22’31”	118°58’33”
	1	D	34°22’32”	118°58’30”
	1	E	34°22’32”	118°58’23”
	1	F	34°22’33”	118°58’22”
	1	G	34°22’33”	118°58’20”
97-185	1	center of potrero creek bridge (single point)	34°08’42”	118°50’07”
97-203	1	detention basin	34°16’20”	118°17’30”
	1	detention basin	34°16’19”	118°17’30”
	2	debris basin	34°16’16”	118°17’42”
98-015	1	planting area 7 out of 8 sites	34°12’06”	118°54’31”
98-018	1	mit site 1 in pico canyon	34°22’41”	118°35’13”
98-032	1	wetland	34°14’44”	119°05’39”
	2	vegetated streambed	34°14’45”	119°05’41”
	2	part 2-vegetated streambed	34°14’49”	119°05’39”
98-072	1	single area	34°09’34”	118°42’20”

Table continues on next page…

File #	Site #	Description	Longitude (N)	Latitude (W)
98-112/98-112 additional acreage	1	East	34°07’21”	118°51’07”
	1	detention basin	34°07’22”	118°51’16”
	2	south	34°07’20”	118°51’08”
	2	south of wetland	34°07’34”	118°51’20”
	3	questionable corridor	34°07’29”	118°51’20”
99-006	1	lake and island	34°15’22”	118°47’33”
99-026	1	channel banks (single point)	34°25’43”	118°33’51”
	2	newhall pkwy restor. (single point)	34°26’03”	118°33’39”
	3	exotic removal (single point)	34°25’40”	118°34’06”
99-037	1	wetland	34°25’05”	119°20’04”
*area to exclude from mitigation site 1		area to subtract from mit site 1	34°25’03”	119°20’07”
	2	riparian area	34°25’08”	119°20’03”
99-045	1	single point	34°16’04”	118°41’35”
99-054	1	single area	34°23’56”	118°30’03”
	1	channel	34°23’56”	118°29’58”
99-055	1	a	34°12’37”	118°55’31”
	1	B	34°12’41”	118°55’37”
	2	riparian streambank	34°12’40”	118°55’28”
	2	rip enhance	34°12’41”	118°55’23”
	2	roadside bank	34°12’41”	118°55’29”
	2	rip enhance	34°12’45”	118°55’20”
*site 3 not in permit requirements, but mitigation plan	3	*Arundo* removal	34°12’40”	118°55’39”
	3	more arundo removal	34°12’39”	118°55’39”
99-100	1	single point	34°01’48”	118°04’08”
00-112	1	single point	34°14’18”	119°00’27”
00-160	1	single area	34°28’01”	118°39’57”
00-166	1	A	34°17’26”	118°55’42”
	1	B	34°17’26”	118°55’44”
	2	upstream	34°17’59”	118°54’52”
	2	downstream	34°17’59”	118°54’53”
00-168	1	created riparian area	34°14’35”	118°59’51”
01-017	1	riparian	34°09’51”	117°55’34”
01-020	1	pipeline crossing	34°25’34”	118°24’54”
01-135	1	streambed	34°26’56”	119°13’30”
*impact feature--not part of mitigation	N.A.	new concrete of pipeline crossing	34°26’56”	119°13’30”
02-108	1	single point	34°31’11”	118°32’03”
02-109	1	single point (coordinates estimated) from map)	34°06’18”	119°06’19”

Table 39. GIS Features—Areas collected at mitigation sites. Features that were created in Arcview are marked with an asterisk. See Table 8 for a description of why these features were created.

File #	Description of GIS Feature	Acreage of Feature
00-160.cor	mit site 1	1.487
00-166.cor	site 1 A	0.752
00-166.cor	site 1 B	0.218
00-166.cor	site 2 upstream	0.004
00-166.cor	site 2 downstream	0.004
00-168.cor	created riparian area	9.361
01-017.cor	mit site 1- riparian	2.106
01-020.cor	mit site 1-pipeline crossing	0.368
01-135.cor	Mitigation Area	0.074
01-135.cor	Impact Area	0.014
92-04.cor	mit site downstream	2.432
92-04.cor	mit site upstream	1.765
93-06.cor	south	1.690
93-06.cor	center	5.554
93-06.cor	north	1.408
93-06.cor	E riprap @ midpoint center	0.158
93-06.cor	W riprap @ midpoint center	0.035
93-09.cor	mit site 1 - west bank	20.904
93-09.cor	mit site 1 - east bank	22.724
93-09.cor	mit site 2 - east	6.382
93-09.cor	mit site 2 - west	2.811
93-15.cor	mit site no 1- zone c wetland	2.633
93-15.cor	mit site no 2 zone A	7.256
93-15.cor	mit 3 - zone A/7	0.362
93-19.cor	freshwater marsh	30.894
95-02.cor	mit site 2	0.047
95-003.cor	mit site 1a- riparian/veg stream	1.711
95-003.cor	mite site 1b	0.304
95-003.cor	mit site 1c	0.092
95-003.cor	mit site 1d	0.470
95-04.cor	mit site 1-north of route 14	0.456
95-04.cor	mite site 1-south of route 14	0.161
95-04.cor	mite site 2- additional removal	0.044
95-08.cor	mit site 1a	16.180
95-08.cor	mit site 1b	1.294
95-08.cor	mit site 2	1.656
95-08.cor	mit site 3	1.472
95-08.cor	mit site 4- riparian canyon	0.208
95-091.cor	mit site 1 wetland	1.161
95-091.cor	mit site 2-upland	2.784
95-091.cor	mite site 3- upland	1.228
95-091.cor	mit site 4- upland	0.795
95-119.cor	mit site 1- detention basin 1	0.234
95-119.cor	mit site 2 detention basin	0.392
95-119.cor	mit site 3 willow in arroyo simi	0.104
96-086.cor	mit site 1 restrative planting	0.108
96-086.cor	mit site 3 arundo removal	1.248

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File #	Description of GIS Feature	Acreage of Feature
96-102.cor	mit site 1 salt marsh	10.004
97-080.cor	mit site 1	7.900
97-088.cor	mit site 2	0.141
97-088.cor	mit site 1	2.183
97-129.cor	basin B North	1.055
97-129.cor	basin B South	0.645
97-129.cor	basin A South	0.883
97-129.cor	basin A north	1.371
97-129.cor	site 3 W basin supply line	0.298
97-175.cor	mit site 1-a	1.360
97-175.cor	mit site 1b	0.369
97-175.cor	mit site 1c	0.107
97-175.cor	mit site 1d	0.256
97-175.cor	mit site 1e	0.374
97-175.cor	mit site 1f	0.238
97-175.cor	mit site 1g	0.497
97-203.cor	mite site 1- detention basin	0.284
97-203.cor	mit site 1b- detention basin	0.241
97-203.cor	mit site 2a- debris basin	0.172
98-015.cor	planting area 7-out of 8 sites	0.590
98-018.cor	mit site 1 in pico canyon	5.194
98-032.cor	mit site 1- wetland	0.173
98-032.cor	mit site 2- vegetated streambed	0.496
98-032.cor	mit site 2-part 2 - veg stream	0.825
98-072.cor		0.358
98-112 additonal acreage	site 1 east	0.149
98-112 additonal acreage	site 2 south	0.067
98-112.cor	mit site 1- detention basin	0.160
98-112.cor	mit site 2- south of wetand	0.091
98-112.cor	mit site 3- questionable coridor	0.726
99-006.cor	mit site 1 lake and island	17.597
99-037.cor	mit site 1- wetland	3.055
99-037.cor	mit site 2-riparian area 1	0.331
99-054.cor	mit site 1	1.018
99-054.cor	mit site 1-channel	1.830
99-055.cor	mit site 1a	2.460
99-055.cor	mit site 1b	3.063
99-055.cor	mit site 2a- riparian streambank	0.457
99-055.cor	mit site 2 roadside bank	0.468
99-055.cor	mit site 3 arundo removal	0.129
99-055.cor	mit site 3 more arundo removal	0.019
99-055.cor	mit site 2c rip enhance	0.017
99-055.cor	mit site 2d rip enhance	0.327
93-15*		5.259
95-091*		0.788
95-062*		1.477
95-091*		0.059

Table 40. GIS area layer data identifying mitigation sites that required calculations involving multiple features to determine acreage.

Datafile (File #)	Mit Site #	Feature Description	Acres Measured	Calculated Area
93-09	1	mit site 1 - west bank	18.093	20.904 (bank including wetland)-2.811 (wetland)=18.093 (bank only)
93-09	1	mit site 1 - east bank	16.342	22.724 (bank including wetland)-6.382 (wetland)=16.342 (bank only)
93-15	4	mit site no 2 zone A	1.997	7.256 (sites 3 and 4)-5.259 (site 3)=1.997 (site 4)
95-091	2	mit site 2-upland	1.623	2.784 (upland including wetland)-1.161 (wetland)=1.623 (upland only)
95-091*	2	fourth basin	0.729	0.788 (upland including basin bottom) -0.059 (basin bottom)=0.729 (upland only)

*The fourth basin (an additional feature added in ArcView; see **Table 41** for a description) associated with File #95-091 can be identified by its Feature Identification Number (FID) which was assigned to all features when the data were imported from Pathfinder to Arcview. The other files in this table can be identified by the feature description in the attribute table of the ArcView file.

Table 41. New features created through editing performed in ArcMap on GPS data exported from GPS Pathfinder Office.

File #	Site	Edits
93-06	1	Created single polygon for "center" feature by changing boundaries to reflect exclusion of the two areas of rip-rap measured in the field to be excluded from the acreage of the feature
95-062	1	Created polygon using 5 guide points and a line recorded in the field because we were unable to walk the entire boundary of the mitigation site
95-091	1/2	Created polygon for fourth mitigation basin (N of easternmost basin) estimating outline from aerial photo and changed boundaries of bottom portion of round basin ("site 3 upland")
93-15	3/4	Split riparian preserve and enhancement based on guide points recorded in the field

Table 42. Accounting of all the information and decisions used in creating proportional acreage estimates for each of the 79 individual mitigation sites. Most of the information was straightforward, but for the files indicated in bold, some additional information or judgment was necessary. Explanations are given as appropriate.

File #	Mitigation Site #	Acreage	Total Acres by File	Proportion	Explanation
00-112	1	point		100.00	Acreage not needed for proportion estimate
00-127	1	point		100.00	Acreage not needed for proportion estimate
00-160	1	1.487		100.00	
00-166	1	0.97	0.978	99.18	
00-166	2	0.008		0.82	
00-168	1	9.361		100.00	
01-017	1	2.106		100.00	
01-020	1	0.368		100.00	
01-135	1	0.074		100.00	
02-109	1	point		100.00	Acreage not needed for proportion estimate
91-02	1	point		100.00	Acreage not needed for proportion estimate
92-04	1	4.197		100.00	
92-10	1	point		100.00	Acreage not needed for proportion estimate
92-11	1	point		100.00	Acreage not needed for proportion estimate
93-06	1	8.652		100.00	
93-09	1	34.435	43.628	78.93	
93-09	2	9.193		21.07	
93-15	1	2.633	10.251	25.69	
93-15	2	5.259		51.30	
93-15	3	1.997		19.48	
93-15	4	0.362		3.53	
93-19	1	30.894		100.00	
94-03	1	point		**50.00**	Site acreage estimated - both sites about equal in size
94-03	2	point		**50.00**	"
94-09	1	point		100.00	Acreage not needed for proportion estimate
95-003	1	2.577		100.00	
95-02	1	**6**	**6.03**	**99.50**	Site #1 - planned acreage of mitigation plan assumed met
95-02	2	0.03		**0.50**	
95-04	1	3		100.00	
95-062	1	point		100.00	Acreage not needed for proportion estimate
95-07	1	point		100.00	Acreage not needed for proportion estimate
95-08	1	17.474	20.81	83.97	
95-08	2	1.656		7.96	
95-08	3	1.472		7.07	
95-08	4	0.208		1.00	
95-091	1	1.161	4.807	24.15	
95-091	2	3.646		75.85	
95-119	1	0.234	0.73	32.05	
95-119	2	0.392		53.70	
95-119	3	0.104		14.25	
96-086	1	0.108	**1.456**	**7.42**	
96-086	2	1.248		**85.71**	
96-086	3	**0.1**		**6.87**	Site acreage estimated - about same as mit site #1

Table continues on next page…

File #	Mitigation Site #	Acreage	Total Acres by File	Proportion	Explanation
96-102	1	10.004		100.00	
97-080	1	7.9		100.00	
97-088	1	2.183	2.324	93.93	
97-088	2	0.141		6.07	
97-103	1	**2.066**	**22.727**	**9.09**	Site acreage obtained from project manager
97-103	2	**20.661**		**90.91**	"
97-129	1	3.954	4.252	92.99	
97-129	3	0.298		7.01	
97-133	1	**2.066**	**22.727**	**9.09**	Site acreage obtained from project manager
97-133	2	**20.661**		**90.91**	"
97-170	1	point		100.00	Acreage not needed for proportion estimate
97-175	1	3.201		100.00	
97-203	1	0.525	0.697	75.32	
97-203	2	0.172		24.68	
98-015	1	**5.7**	**7.08**	**80.51**	Site acreage obtained from project manager
98-015	2	**0.1**		**1.41**	"
98-015	3	**1.28**		**18.08**	"
98-018	1	5.194		100.00	
98-032	1	0.173	1.485	11.65	
98-032	2	1.312		88.35	
98-072	1	0.358		100.00	
98-112	1	0.309	1.126	27.44	
98-112	2	0.091		8.08	
98-112	3	0.726		64.48	
98-196	1	point		100.00	Acreage not needed for proportion estimate
99-006	1	17.597		100.00	
99-026	1	point		**33.33**	Site acreage estimated - all sites about equal in size
99-026	2	point		**33.33**	"
99-026	3	point		**33.33**	"
99-037	1	3.249	3.58	90.75	
99-037	2	0.331		9.25	
99-045	1	point		100.00	Acreage not needed for proportion estimate
99-054	1	2.848		100.00	
99-055	1	5.523	6.792	81.32	
99-055	2	1.269		18.68	
99-100	1	point		100.00	Acreage not needed for proportion estimate

10.7. Appendix 7: 401 Permit Conditions

In this appendix, we list all the standard and special conditions found in the 50 Section 401 permit files included in this study. Those common conditions that were present in the majority of permit files are displayed in Table 43. Those conditions that were less common and often highly specific to a particular file are listed in Table 44.

Table 43. Common conditions found in 401 permits stipulating conditions for mitigation. These were included in our permit compliance evaluation form as standard conditions.

Common 401 Permit Conditions	Options
Maintained in perpetuity	Yes/no
Within easement	Yes/no
Grading to pre-project contours	Yes/no
Removal of exotics	Yes/no
Revegetate with natives	Yes/no
Revegetation species specified	Yes/no
Required submission of mitigation plan	Yes/no
Monitoring schedule	Number
Monitoring duration	Number
Years of irrigation required	Number
Mitigation as per 404	Yes/no
Mitigation as per DFG	Yes/no

Table 44. Uncommon conditions found in 401 permits stipulating conditions for mitigation. These were included in our 401 Permit Compliance evaluation as additional conditions.

Uncommon 401 Permit Conditions
Management Actions
Maintained in perpetuity
Monitoring schedule
Monitoring duration
Years of irrigation required
Removal of exotics
Grading to pre-project contours
remove surface debris
any native plants removed for excavation will be mulched and used to recover re-graded areas
rock placement and CA rose and mulefat hydro-seeding adjacent to browns cyn rd to limit access
the cut slope and remainder of the canyon shall be hydro-seeded with a mix of coastal sage scrub species endemic to the locale
debris removal
construction during dry season
avoid 57% (.79 acre) of existing *Pentachaeta* populations
perform annual surveys in the spring
perform seed storage and viability testing over a ten year period to assist the resources agencies establishing conservation and recovery programs
work limited to dry season
diversion of flows, via earthen berm and corrugated steel pipe
all temp fill material moved to an upland site during the wet season
no grading within the active flow
Performance Standards
plant survival =80% after year 1, =100% after year 2
80% survival of plantings after 1st year, 100% thereafter OR 80% cover of native species after 3yrs
80% survival after 1st yr, 100% thereafter, OR 75% cover after 3 yrs and 90% cover thereafter, native cover only
success will be based on target functions, hydrological regime, and jurisdictional acreage being restored
75% cover after 3 yrs, 90% cover after 5 yrs
attain 70% cover within 3 years
attain 90% cover within 5 years
achieve 85% success rate for mitigation plantings at the end of the 1st and 2nd years after planting, or a 75% success rate at the end of years 1, 2, and 3
Specific Actions/Conditions
remove cattle grazing in the preserve
create a wildlife watering station
vegetation will be allowed to grow to a certain height, after which it will be "maintained"
removal of Arundo, tree tobacco, castor bean along 1200 ft of barranca
restore and repair fence separating Hughes and Emile parcels (of 130 acres preserve) to eliminate cattle degradation of habitat
remove barb wire fence and debris within Emile parcel
additional mitigation shall be provided at a 1:1 ratio per maintenance event to offset any subsequent impact to aquatic resources as a result of future soft-bottom channel excavations. If onsite mitigation is unavailable, in-lieu fees must be transferred
planting mulefat upstream of check dam on stream banks
any native trees removed will be replaced at a 10:1 ratio

Table continues on next page…

Uncommon 401 Permit Conditions (continued)
Specific Actions/Conditions (continued)
soil sampling required during first two years
if onsite mitigation cannot be fulfilled, sufficient funds will be transferred to a conservation agency for the creation of 0.0207 acres
additional compensatory mitigation at a 1:1 ratio per maintenance event for any additional impacts from soft-bottom channel excavations, if onsite mitigation is not possible, then transfer sufficient in-lieu fees
plant willow cuttings on the back sides (the downstream sides) of the new groins
planting of mulefat cuttings
installation of culverts
planting willow cuttings
Revegetation species specified
Revegetate with natives
applicant shall contour the invert portion of the canyon fill such that stream meanders and pooling can occur, potentially creating approximately 1.07 acres of mulefat riparian shrub area
Submission Requirements
Required submission of mitigation plan
Within easement
annual monitoring reports required until completion
required submission of final monitoring report
the whole preserve will be deeded to an appropriate conservation agency
mitigation for indirect possible impact of .954 acres will be evaluated in annual monitoring reports and if necessary, mitigated at a 3:1 ratio
submit "proof of feasibility" of the 100-acres onsite preservation within 90 days of cert date.
required to submit a "fish migration plan" to ensure protection of 3spine stickleback
130 acre open space preserve will be transferred to Santa Monica Mountains Conservancy by 12/31/01
prior to construction, applicant will submit proof of in lieu fee transfer
required submission of a wetland delineation report identifying wetlands within the 75 acres acquisition area, due within one year of property acquisition and prior to any discharge
also reqs in lieu fees, NOT as per CADFG
within 90 days of cert date, documents must be submitted showing dollar transfer amount, size and location of in-lieu fees
submit a final mitigation monitoring report
Caltrans pledges to create and submit some sort of mitigation plan to the RWCQB
Acreage/Habitat Specifications
Hydro-seeding 0.38 acres w/ mix of native grasses and mulefat
all "mitigation conditions" apply to in-lieu destination
Mitigation located within the Habitat Conservation Area, supported hydrologically by CDS treated runoff from the developed portion of the project
preserve 68 oak tress, plant 300 more in 9.37 acre preserve
any future impacts to existing wetlands within the 75 acres acquisition area shall be mitigated 3:1 for perm impacts and 1:1 for temp impacts
mitigation includes .46 acres of riffle-pool and boulder bar habitat w/I channel
.43 acres of wetland habitat in side channel areas and adjacent to bank-full line of restored creek
.34 acres of white alder/willow woodland on the slopes and terraces along creek bed
preserve 30 acres of upland habitat containing .492 acres of jurisdictional streambed
create .66 acres of seasonal palustrine emergent wetland
create .42 acres of palustrine unconsolidated bottom habitat
creation of protective buffer zone of .92 acres around created mitigation site

Table continues on next page…

Uncommon 401 Permit Conditions (continued)
References to other documents to follow
Mitigation as per 404
Mitigation as per DFG
mitigation shall be implemented in compliance with specifications detailed in site restoration plan
applicant shall implement mitigation measures from LA Co Conditional Use and Oak Tree Permit
develop a final herbicide plan for Area D mitigation site at Lower Arroyo Seco Natural Area
develop a mosquito abatement plan
comply with mitigation measures in "Resolution of City Council of Agoura Hills Approving a Site /Architectural Review and Exhibit A"

10.8. Appendix 8: Wetland Evaluation Assessment (WEA)

The Wetland Evaluation Assessment (WEA) is a mitigation site evaluation methodology created by Andrée Breaux (SFRWQCB) and Molly Martindale (SF ACOE) as an adaptation of the Florida Wetland Rapid Assessment Procedure (WRAP). This method was created specifically for the evaluation of compensatory mitigation projects and the complete methodology can be considered an alternative to our combined Phase I and Phase II evaluations. Breaux and Martindale (2003) used the WEA in a recent study of San Francisco Bay Area mitigation projects, and we sought to repeat their methods here to evaluate their method compared to CRAM and to provide information to compare southern California mitigation projects to those in northern California (although such a comparison is beyond the scope of this report). However, much of WEA was time consuming, requiring the creation of comprehensive species lists by expert plant, invertebrate, and bird experts, and since these aspects of the method were outside the scope of our study, we did not include them in our site evaluations. In addition, we did not use the "overall compliance" score as this was redundant with our compliance evaluation. We simply used the main qualitative evaluation protocol, which assessed site function through five assessment categories on a summed 0-15 scale. These five categories are: surrounding land use, adjacent buffer, indicators of hydrology, averaged vegetation score, and wildlife utilization. This method is heavily focused on vegetation, and evaluates the vegetation community within three structural layers: herbaceous, shrub, and tree. We also included an overall "all vegetation combined" evaluation for comparison. Although we do not report on these data here, this score proved to yield very similar results to the combined vegetation score from their structural layer assessments.

The results of our WEA assessments for all 79 individual mitigation sites are given in Table 45. This table displays the actual WEA scores for each category, which were on a 0 to 3 scale, and the last column gives the total WEA score, for which the highest possible score was 15. The total WEA scores are displayed graphically in Figure 83. The data appear normally distributed around a mean score of 9.3 (61.8%), with 5 sites (6.3%) greater than or equal to 80% (successful), and 15 sites (19.0%) less than or equal to 50% (failing). Compared to the UCLA-CRAM "totals" results given in Section 5.4, which had a mean score of 56.4% with 3 successful sites (3.8%) and 23 failing sites (29.1%), the WEA results indicate that this evaluation methodology yields somewhat higher function scores than the corresponding CRAM methods.

The next five figures display the WEA results by evaluation category. On the WEA scale of zero to three, we consider 3 to be successful, 2 to be partially successful, and less than 2 to be failing. The adjacent land use results from the WEA evaluation are shown in Figure 84. Most sites achieved high scores for this metric, with 27 sites that were considered successful with respect to this metric (34.2%) and only one failing site. There is no evaluation category in the CRAM methodology that is analogous to this adjacent land use metric. Adjacent land use and the other stressors that may influence the condition of a site were considered separately in CRAM.

For adjacent buffer (Figure 85), the sites did not do as well, with 22 successful sites (28%) and 19 failing sites (24%). Four of these failing sites received a zero score. However, compared to the UCLA-CRAM totals for landscape context, for which 7 sites (9%) were successful and 34 sites (43%) failed, it appears that WEA yields substantially higher buffer scores than CRAM.

The WEA scores for hydrology are given in Figure 86. Five of the 79 mitigation sites were considered successful for hydrology (6%), while 22 sites (28%) were considered as failing. Two of these failing sites received a zero score. Compared to the UCLA-CRAM totals for hydrology for which 7 sites (9%) were successful and 18 sites (23%) failed, WEA again yields higher scores than CRAM, though somewhat less so than for the buffer category.

The WEA scores for vegetation at the 79 mitigation sites are given in Figure 87. Almost half of the sites (49%, 39 sites) were considered successful while only five sites (6%) failed. While there is no evaluation category in the CRAM methodology that is directly analogous to this vegetation assessment, the biotic structure category was designed to address similar aspects of site function. Comparing these results to the UCLA-CRAM biotic structure totals, with 7 sites (8.9%) successful and 31 sites (39.2%) failing, the WEA evaluation seems to view these mitigation sites more favorably than does the CRAM evaluation, with these two assessments yielding almost opposite results. This makes some sense given WEA's emphasis on plants, and given that vegetative plantings tend to be the focus of most mitigation projects.

From the wildlife utilization evaluation of WEA (Figure 88), 8 sites were considered successful (10.1%) while 25 sites (31.6%) were considered as failing. The CRAM methodology does not consider the presence of wildlife in any of its evaluation criteria, so no comparison between these methods is possible here.

From the above results, it is apparent that employing the WEA methods will yield a somewhat elevated view of a mitigation site's function or condition compared to the equivalent CRAM evaluation of the same site. Nonetheless, there was a fairly good correlation between WEA and UCLA-CRAM (Figure 89). It is not certain which of these evaluations yields the more accurate picture of the function of mitigation sites since neither of these methods have been extensively calibrated through their evaluation of reference condition. However, it seems that WEA has been tailored for evaluating the target conditions of mitigation sites, while CRAM was developed to assess more general wetland habitats.

Table 45. WEA Scores for all sites evaluated fully (79 mitigation sites within 50 files).

File #	Mitigation Site #	Surrounding Land Use	Indicators of Hydrology	Adjacent Buffer	Averaged Vegetation Score	Wildlife Utilization	Total Breaux and Martindale Score
91-02	1	2.3	2	3	2	2	11.3
92-04	1	1.95	2	1	2.5	2	9.45
92-10	1	1.6	2	2	2.3	2	9.9
92-11	1	2.25	2	3	2.08	2	11.33
93-06	1	1.85	3	2	2.92	3	12.77
93-09	1	1.6	1	2	1.56	2	8.16
93-09	2	1.75	2	3	2.75	2	11.5
93-15	1	1.63	3	1	2.75	2	10.4
93-15	2	2.15	0	3	1.08	0	6.2
93-15	3	2.05	3	3	3	3	14.3
93-15	4	2.05	1	3	2.75	3	11.8
93-19	1	1.9	2	2	2.67	2	10.57
94-03	1	0.95	1	0	0.75	1	3.7
94-03	2	2	3	3	2.42	3	13.42
94-09	1	1.1	2	2	1.58	1	7.68
95-003	1	2.4	2	2	1.67	1	9.07
95-02	1	1.58	1	1	2.3	2	7.91
95-02	2	2.7	1	3	1.75	1	9.45
95-04	1	1.35	2	1	1.42	1	6.77
95-062	1	2.2	2	3	2.17	2	11.37
95-07	1	1	2	1	0.5	1	5.5
95-08	1	1.7	2	1	2.58	3	10.28
95-08	2	1.95	2	2	2.25	2	10.2
95-08	3	1.95	2	3	2	2	10.95
95-08	4	1.95	2	3	2.25	2	11.2
95-091	1	1.05	1	1	1.08	0	4.13
95-091	2	1.05	1	1	1.25	0	4.3
95-119	1	1.5	2	0	2.58	2	8.08
95-119	2	1.5	0	0	0.75	0	2.25
95-119	3	2.05	1	2	1.83	2	8.88
96-086	1	2.05	2	2	1.83	2	9.88
96-086	2	2.05	2	2	1.08	2	9.13
96-086	3	2.05	2	2	1.67	2	9.72
96-102	1	1.8	2	1	2.3	2	9.1
97-080	1	2.55	2	2	2.17	3	11.72
97-088	1	2.3	1	2	2.42	2	9.72
97-088	2	2.3	1	3	2.58	2	10.88
97-103	1	1.25	1	2	1.42	1	6.67
97-103	2	1.25	2	2	1.25	1	7.5
97-129	1	1.45	2	1	2.5	2	8.95
97-129	3	1.45	1	1	0.83	0	4.28

Table continues on next page…

File #	Mitigation Site #	Surrounding Land Use	Indicators of Hydrology	Adjacent Buffer	Averaged Vegetation Score	Wildlife Utilization	Total Breaux and Martindale Score
97-133	1	1.25	1	2	1.42	1	6.67
97-133	2	1.25	2	2	1.25	1	7.5
97-170	1	1.8	2	2	2	2	9.8
97-175	1	1.8	2	2	1.33	2	9.13
97-203	1	1.95	1	2	1.58	1	7.73
97-203	2	1.8	1	2	1.5	1	7.3
98-015	1	2.45	2	3	2.5	2	11.95
98-015	2	2.45	2	3	2	2	11.45
98-015	3	2.45	2	3	2.33	2	11.78
98-018	1	2.1	1	2	2.17	2	9.27
98-032	1	1.5	2	0	2	1	6.5
98-032	2	1.65	2	2	2.25	2	9.9
98-072	1	2.28	1	3	0.92	1	8.2
98-112	1	1.65	2	2	1.83	1	8.48
98-112	2	1.65	2	2	2.17	2	9.82
98-112	3	1.65	1	1	2	1	6.65
98-196	1	1.8	2	2	1.75	2	9.55
99-006	1	1.5	2	1	2.5	3	10
99-026	1	1.5	2	2	2.33	2	9.83
99-026	2	1.5	2	2	1.83	2	9.33
99-026	3	1.5	2	2	2.5	2	10
99-037	1	2.6	2	3	2.08	2	11.68
99-037	2	2.6	2	3	2.08	2	11.68
99-045	1	1.8	2	1	2.08	2	8.88
99-054	1	2	1	2	2	1	8
99-055	1	2.2	2	3	2.67	3	12.87
99-055	2	2.6	2	2	2.42	1	10.02
99-100	1	2.15	1	2	2.33	2	9.48
00-112	1	2.1	2	3	2.5	2	11.6
00-127	1	1.8	2	2	1.75	2	9.55
00-160	1	1.95	2	2	1.92	2	9.87
00-166	1	1.3	2	1	2.67	2	8.97
00-166	2	1.2	2	2	1.33	1	7.53
00-168	1	1.55	2	2	2.17	2	9.72
01-017	1	1.8	3	3	2.25	2	12.05
01-020	1	2.3	2	3	1.83	2	11.13
01-135	1	1.975	2	2	1.25	1	8.23
02-109	1	1.8	2	2	1.75	2	9.55

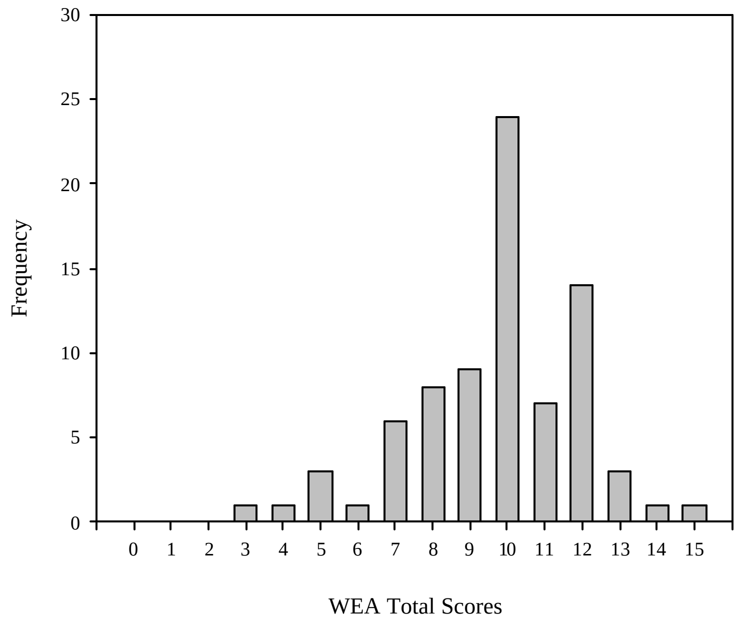

Figure 83. WEA Total Scores histogram for all sites evaluated fully (N=79 mitigation sites within 50 files).

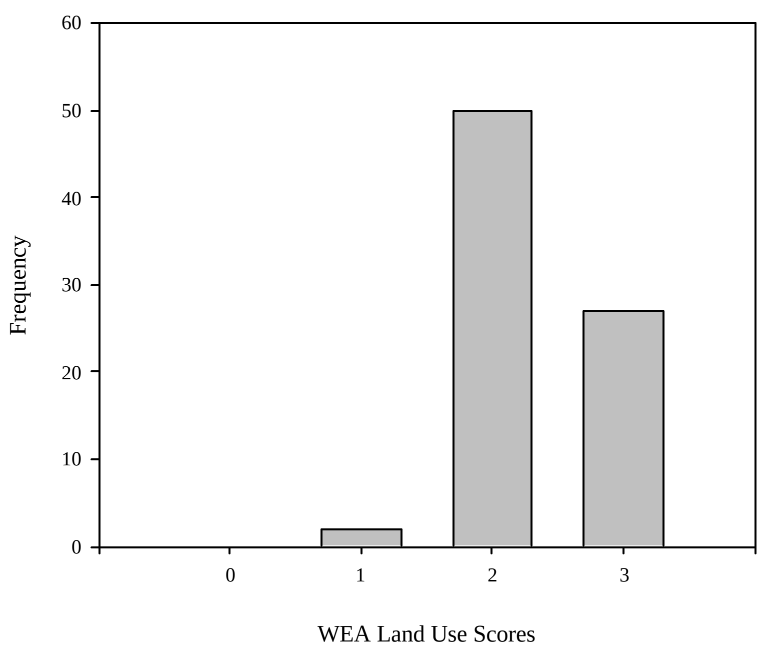

Figure 84. WEA Land Use Scores histogram for all sites evaluated fully (N=79 mitigation sites within 50 files).

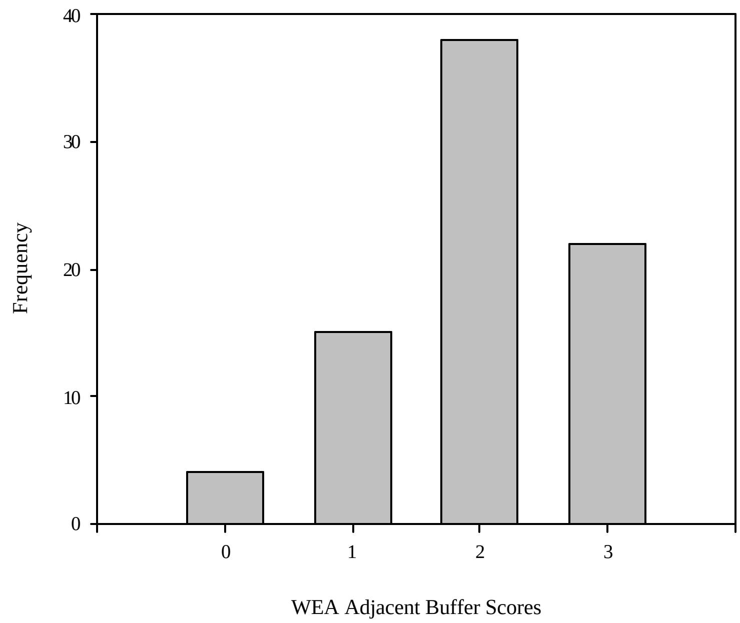

Figure 85. WEA Adjacent Buffer Scores histogram for all sites evaluated fully (N=79 mitigation sites within 50 files).

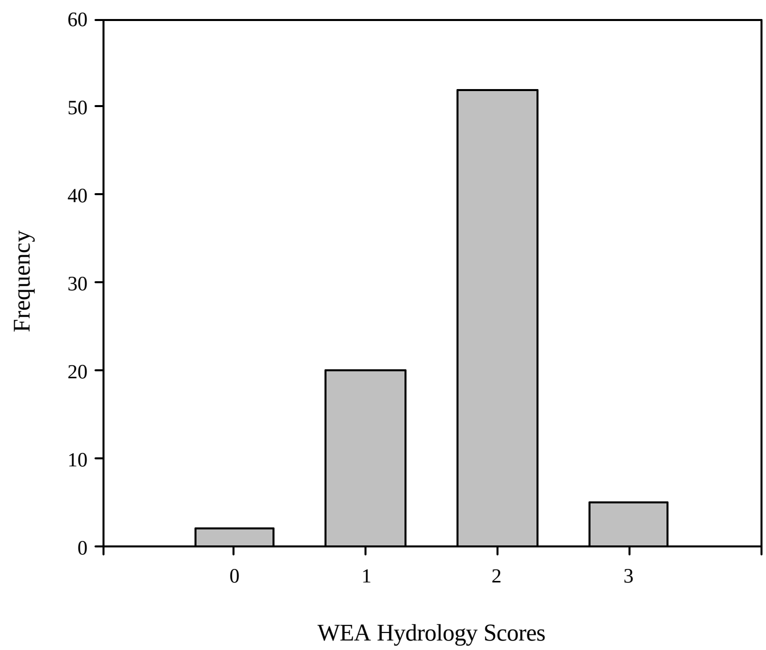

Figure 86. WEA Hydrology Scores histogram for all sites evaluated fully (N=79 mitigation sites within 50 files).

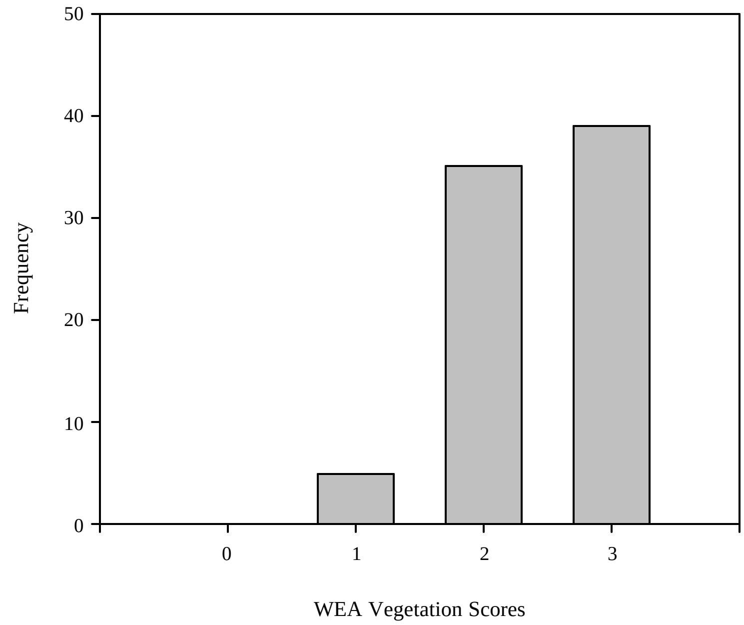

Figure 87. WEA Vegetation Scores Histogram for all sites evaluated fully (N=79 mitigation sites within 50 files).

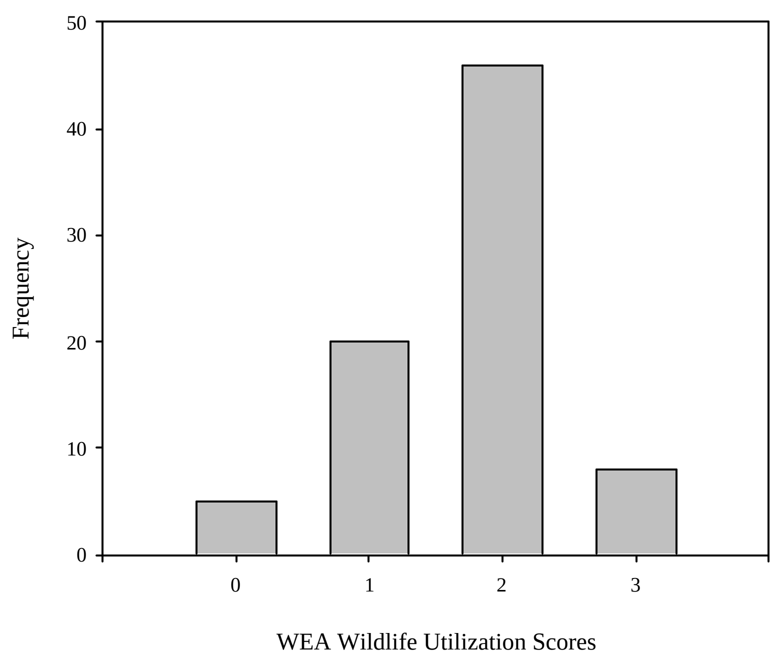

Figure 88. WEA Wildlife Utilization Scores histogram for all sites evaluated fully (N=79 mitigation sites within 50 files).

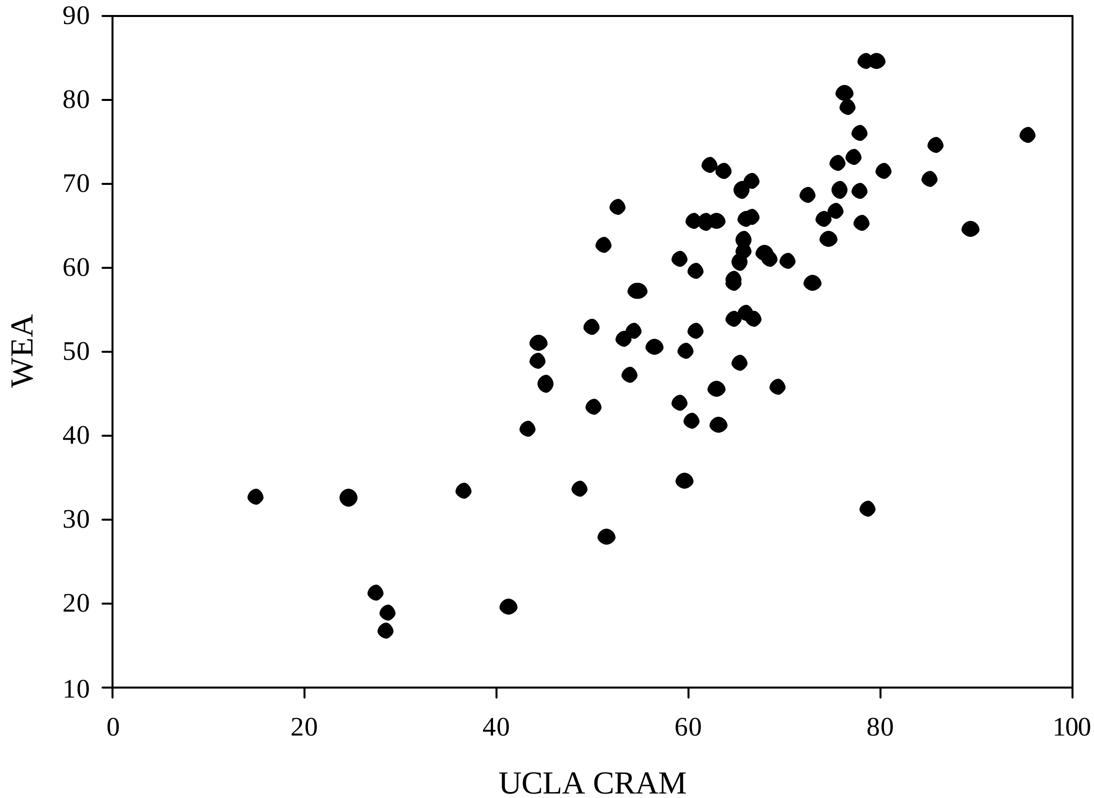

Figure 89. Correlation between UCLA CRAM and WEA scores by site.

10.9. Appendix 9: Contract Administration Issues

This Appendix describes some of the administration issues that arose during the completion of this contract.

The project was initiated when the LARWQCB was awarded $100,000 from the USEPA, which they matched with $34,000 of state supported funds, for a total of $134,000 for the study. Due to a hiring freeze and other budgetary problems, the LARWQCB was not able to carry out this study internally. Instead they contracted with UCLA to perform the study. UCLA's original proposal, submitted in January 2003, called for a 13-month study beginning in May 2003. Following its conditional acceptance, the start date of the contract was substantially delayed as various contracting issues were resolved between the University and State Water Board contracting offices. By the time the contract was approved on October 3, 2003, the stated contract start date (July 31, 2003) had past. The delayed start date meant that the schedule of tasks and deliverables in the approved contract was immediately out of date. For example, the first quarterly report was due four days after work commenced. After consultation with the Regional Board staff, UCLA requested an adjustment to the schedule of deliverables. Although a request for a modified schedule was submitted to the Regional Board, no formal response was received.

The early conceptualization of this project, reflected in the contract, called for a two-phase evaluation effort. Phase I was to involve an initial site reconnaissance visit at all 50 sites, including a permit compliance evaluation and a GPS-based survey of the site to determine mitigation project acreages. A subset of 25 sites were to be visited a second time to perform a functional evaluation (Phase II), which would be more time consuming than the reconnaissance visit. After a series of early site visits, we determined that a substantial amount of time was required simply to understand the nature of the impact and mitigation projects and to locate the precise boundaries of the mitigation site(s), given the frequent lack of detailed information in the permit files. This, and the fact that individual permit files commonly involved several independent and distinct mitigation projects, meant that it was not feasible to perform quick compliance visits of several nearby projects on the same field day. In addition, during those early site visits, we tested the use of our functional assessment evaluation method and determined that the functional evaluation could be performed relatively quickly once the mitigation site boundaries were determined. Because much of the information needed for the functional assessment could be collected while determining the mitigation site boundaries, we decided it would be feasible to perform the functional assessment for all 50 files. We decided, therefore, that it was much more efficient to perform both the initial compliance assessment and the functional evaluation on the same day, rendering a second visit unnecessary. For files with multiple discrete mitigation projects, separate evaluations were performed at each site. As a result, we evaluated more than **triple** the number of sites planned for "Phase II," totaling 79 separate evaluations compared to the expected 25. Despite the clear benefits of this extra work to both the project and the LARWQCB, our decision to combine the Phase I and Phase II assessments into a single site visit complicated the administrative issue of how we satisfied deliverables, since the language of the contract had envisioned two separate visits.

Contracting issues represented the most significant obstacles we faced in carrying out this study. In addition to the issues mentioned above (delay in start date and subsequent need to revise the schedule of deliverables, and difficulty in interpreting deliverable requirements because we did more work than envisioned), there was confusion about deliverable requirements and timing. For some deliverables, the contract language was not explicit enough to indicate exactly what should be included, necessitating an effort to get clarification from the Regional Board staff. The Regional Board also had specific formatting requirements for progress reports that were not clear to us initially, but were resolved after continued discussions and feedback. There was also confusion over when deliverables should be provided to the Regional Board; in spite of specific dates in the (amended) schedule, the Regional Board requested that we hold all deliverables until the next progress report due date. Because we were concerned about contractual obligations, we typically submitted deliverables twice, once when they were due and again with the progress report. This caused some confusion with the Regional Board staff until we learned to label and format the deliverables more clearly.

Perhaps the most difficult contracting issue to resolve involved invoicing. Invoicing complications existed due to incompatible operating procedures between University and LARWQCB accounting personnel (and the Regional Board obligations to the U.S. EPA). The LARWQCB required that the University's invoices followed the same schedule as our quarterly progress report submissions with exact agreement with the reported progress for the completion of tasks and subtasks. This did not match the standard procedures employed by the University accounting department, and required much correspondence and extra involvement by the Principal Investigator (who typically is not involved with the University's invoicing) to enact.

All the above contracting issues seemed to stem from the fact that LAWRQCB contracts are better structured for consulting companies or other organizations with more flexible accounting practices and standard procedures equipped to accommodate the requirements of a state agency. Even though it is also a state agency, the University of California has an equally large bureaucracy with its own set of requirements that are not easily meshed with the State Board's requirements. However, none of the above contracting issues hindered the successful completion of the project or in any way degraded the net outcome of this study's findings.

During the course of the project, the UCLA team had frequent communication with Regional Board staff, including numerous email correspondences, conference calls, meetings and a field visit. These communications served to keep LARWQCB staff apprised of our progress and to discuss key issues with respect to data collection and contract management. Ample communication occurred during the permit review stage of the project wherein agency staff facilitated our review of their permit files and discussed many aspects of that process with our staff. UCLA met with Regional Board staff in the field at several actual mitigation project locations to go over the methodology we had developed and we incorporated their comments into our final refinement of the methods that were employed at all of the sites. Abundant communication occurred as contract-related items arose. Following the collection of our GPS information, we communicated with agency staff regarding the necessary format for these data, and these data were incorporated into a regional GIS layer by agency staff.

There was only one technical problem encountered during this project: access was denied to one of the sites chosen for evaluation. (This problem was actually much smaller than expected, since access to study sites has been a more significant issue in other field studies.) Agency staff worked to resolve this single denial of site access, although legal counsel had to be consulted and there was a substantial time during which it was unclear whether or not access would be granted. Since this access denial occurred for our penultimate site assessment, and since the legal negotiations between the LARWQCB and the permittee continued for one and one-half months, this resulted in a substantial delay in the submission of one of our deliverables as we waited for a resolution. In the meantime, we added an additional field assessment as a contingency in case access to the original site was never resolved. Eventually, we had to set a deadline for receiving access so that we could move forward with the analysis stage of the project. Since access was never resolved before this deadline, our alternative site ended up being our 50th assessed file.

Regional Board staff provided feedback and comments on the draft versions of this final report and the associated guidance document. The drafts also received comments by Andree Breaux of the San Francisco Bay Regional Water Quality Control Board, Molly Martindale of the San Francisco office of the U.S. Army Corps of Engineers, and Paul Jones of U.S. EPA. The draft was also discussed during a conference call between UCLA/Regional Board and U.S. EPA, and a “CorComm” conference call organized by the State Water Resources Control Board.